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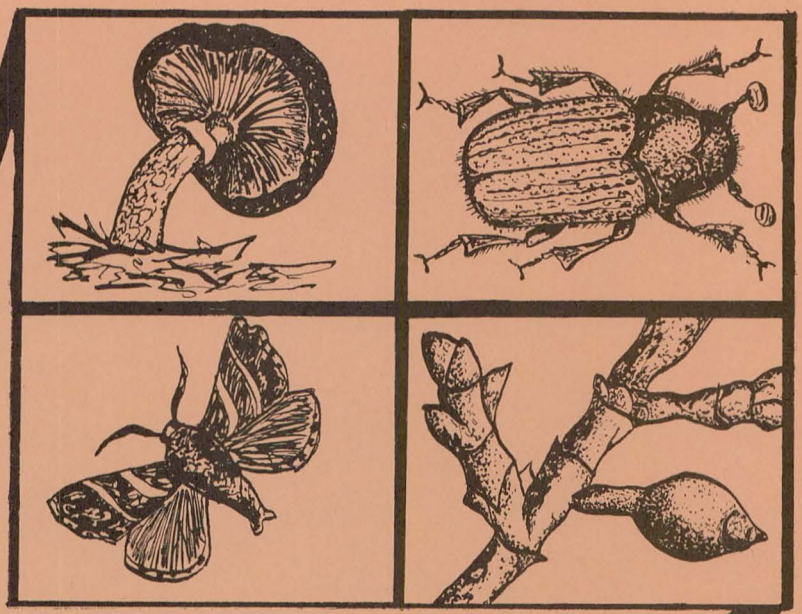

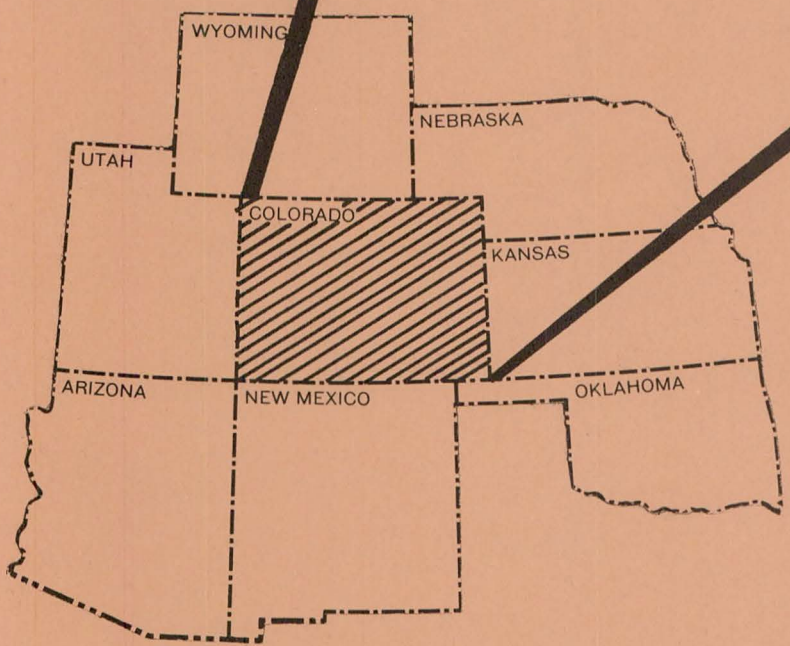

FOREST INSECT AND DISEASE CONDITIONS

COLORADO 1977

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FOREST

INSECT AND DISEASE

CONDITIONS

1977

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March 1978

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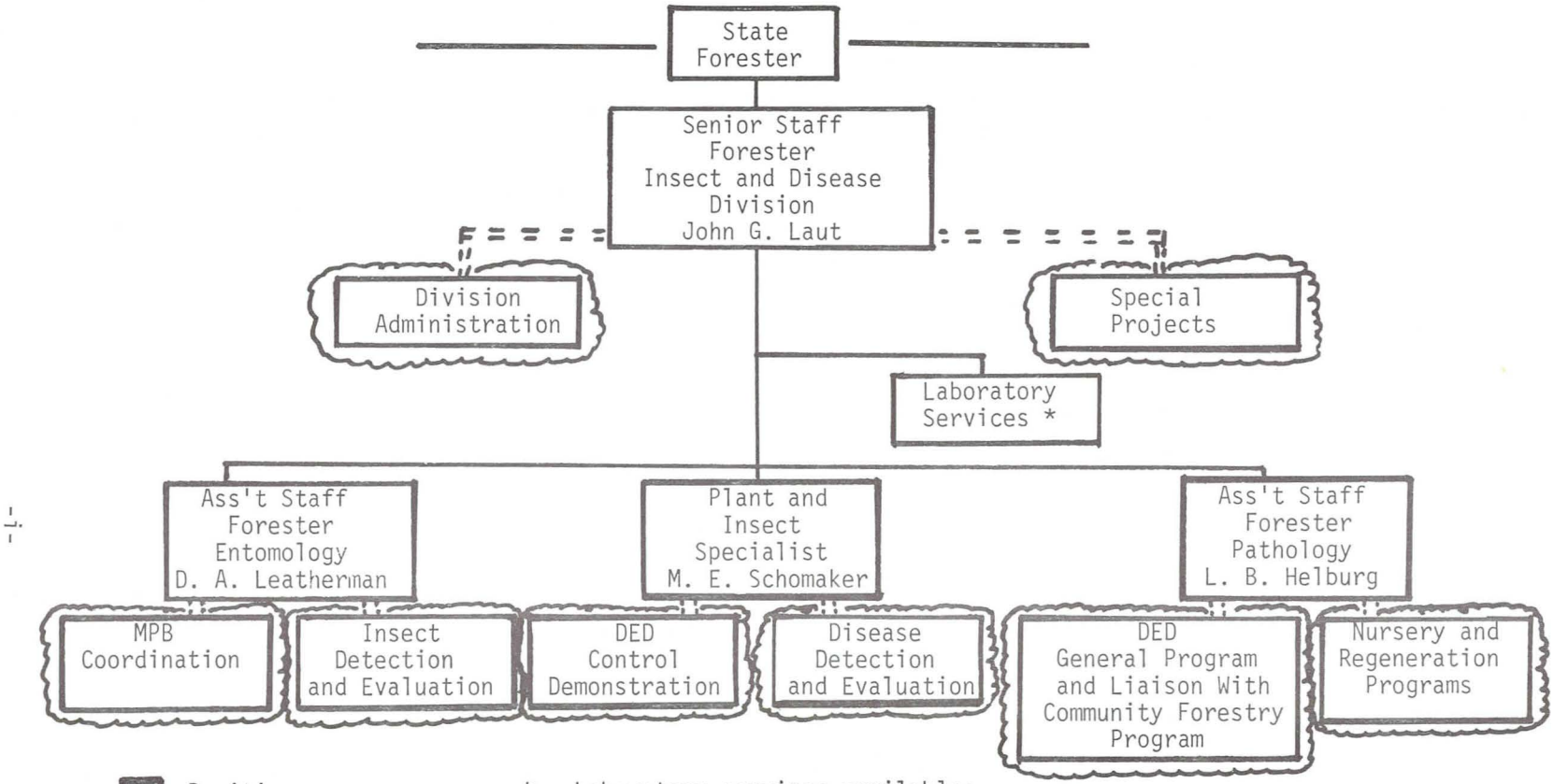
Colorado State Forest Service
Insect and Disease Division-1978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Insect Detection and Evaluation
DED Control Demonstration
Disease Detection and Evaluation
DED General Program and Liaison With Community Forestry Program
Nursery and Regeneration Programs

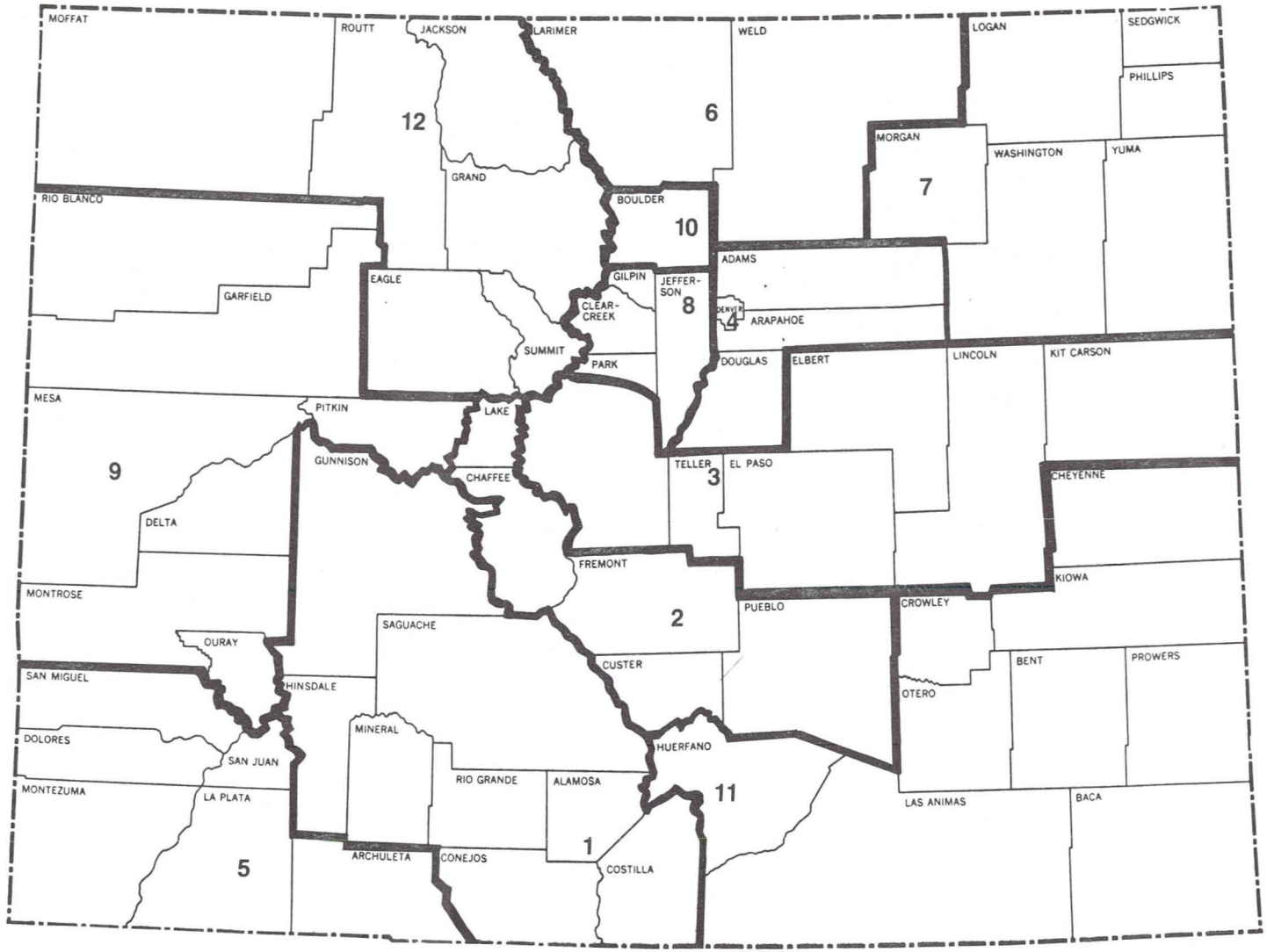
Positions

Responsibilities

* Laboratory services available:

.. Identification of disease organisms and insects.
.. Control advice and recommendations.
.. General or specific information on tree insects and diseases.
.. Service of special requests.
.. For field diagnosis of tree problems, contact the local District Office of Colorado State Forest Service.

COLORADO



COLORADO STATE FOREST SERVICE DISTRICTS
(DISTRICT NAME....DISTRICT OFFICE SITE)

1 Alamosa.... Alamosa
2 Canon City.... Canon City
3 Woodland Park..... Woodland Park
4 Denver.... Aurora
5 Durango.... Durango
6 Fort Collins.... Fort Collins
7 Fort Morgan.... Fort Morgan
8 Golden.... Golden
9 Grand Junction.... Grand Junction
10 Boulder..... Left Hand Canyon
11 Lower Arkansas (LARK).... LaVeta
12 Steamboat Springs.... Steamboat Springs

ACKNOWLEDGMENTS

We would like to thank those individuals and agencies who contributed to this report.

Special mention goes to the U. S. Forest Service (including Region 2, FIDM Staff; Rocky Mountain Forest and Range Experiment Station, I&D Specialists; individual National Forest personnel; and John Peacock and Roy Cuthbert of the Northeastern Forest Experiment Station Branch at Delaware, Ohio), the Bureau of Land Management, the National Park Service, the Colorado Department of Agriculture, Colorado State University (Extension Specialists and General Faculty), various City Forestry and Parks Divisions (notably Boulder, Colorado Springs, Denver, Fort Collins, Greeley, Loveland and Pueblo), County Foresters and Pest Inspectors and certainly dozens of private landowners and commercial tree companies.

INTRODUCTION

This report is Colorado State Forest Service' (CSFS) first annual attempt to consolidate insect and disease information pertaining to Colorado's tree resources. Emphasis is given to state and private lands in accordance with our charged responsibilities. Persons seeking additional Insect and Disease (I&D) information for federal lands are referred to the U. S. Forest Service, Rocky Mountain Region's Forest Insect and Disease Management Annual Report.

The purposes of this report include:

... To serve as a handy reference on the what, where and extent of insect and disease conditions in Colorado during the past year.

... To provide a reasonably complete inventory of Colorado's significant and potentially significant pests by host.

... To begin an accumulation of information of historical and, hopefully, immediate value to present and future professionals having forest protection responsibilities.

... To alert (for both practical and educational reasons) foresters and landowners to pest problems in areas of the state other than their own.

... To relay and introduce new or otherwise interesting pest problems and trends.

... To inform the public and interested governmental agencies of CSFS' recent activities and available services within the I&D Function.

... To present local pest conditions in light of their state-wide impact or importance (this should allow for between-locale and even between-year comparisons).

STATE-WIDE HIGHLIGHTS 1977

INSECTS

(1) Mountain pine beetle *(Dendroctonus ponderosae)* dominated the pest picture in Colorado, as it has since inception of the current epidemic (approximately 1959-60). Estimates of numbers of currently-infested ponderosa pine on all ownerships range from 1.5 million trees to well over 2 million. The great majority of these are concentrated in a band approximately 40 miles wide ranging from the Wyoming line south through the Front Range (including the Black Forest) to the Wet Mountain Valley southwest of Pueblo. (See map on page 9a.)

The Front Range Vegetative Management Pilot Project in Boulder County became operational in October of this year, and is the first large-scale effort funded in recent years to address the causes of the current mountain pine beetle problem (see page 10 for details).

Direct mountain pine beetle (MPB) control efforts continued at high efficiency in 48 Designated Control Areas (DCAs) throughout the Front Range. Coordinated efforts under the guidance and leadership of CSFS led to treatment of over 90,000 trees on 331,000 acres. The shift away from chemical control to long-term solutions through forest management is proceeding, but slowly. Persistent high numbers of MPB-trees within DCAs are also a source of frustration to all concerned. Nevertheless, progress is being made and CSFS efforts to protect state and private forest resources from MPB in 1978 will continue.

The Woodsman Program, under the direction of CSFS' Golden District personnel cooperating with the State Department of Corrections in Jefferson County, proved successful in its first year, and with expansion in 1978 should greatly assist the ongoing MPB efforts there. Chronic infestation areas in need of labor-intensive control operations are being cleaned up by correctional crews. Preventative management and timber stand improvement work is also being performed.

An upward trend in MPB numbers is evident at both the southern end of the Front Range (Custer, Huerfano and Las Animas Counties) and in ponderosa pine regions of southwestern Colorado.

MPB infestations continue in lodgepole pine at Dillon, Granby to Hot Sulphur Springs, and in parts of Middle Park. A growing number of reports of MPB in large-diameter lodgepole have come from higher elevations of the Front Range.

(2) Engraver beetle *(Ips* spp.*)* reports were up this year, especially along the Front Range where it is presumed large amounts of suitable breeding material have resulted from MPB activity.

(3) Western spruce budworm *(Choristoneura occidentalis)* defoliated Douglas-fir and other conifers throughout the state. Among the hardest hit areas were portions of Estes Valley, Sugarloaf and Flagstaff Mountains in Boulder County, the Cuchara-Spanish Peaks area south of La Veta, and the Vallecito area north of Durango.

(4) Douglas-fir tussock moth *(Orgyia pseudotsugata)* seriously defoliated ornamental blue spruce in both the Denver and Colorado Springs metropolitan areas. Damage was also confirmed in Boulder. U. S. Forest Service (USFS) pheromone traps caught male moths in several mountain and urban locations along the Front Range.

(5) Ponderosa needle miner *(Coleotechnites* sp.*)* was recorded from numerous Front Range and Black Forest locations as well as near Durango. Its impact is not well understood.

(6) An unidentified web-making defoliator of ponderosa pine resembling the pine webworm *(Tetralopha robustella)* was again detected at two known 1976 locations and at two new 1977 locations, all within Larimer or Boulder Counties. If this insect does prove to be pine webworm, the above locations are a range extension of over 900 miles from the reported western limit in Minnesota.

(7) White fir needle miner *(Epinotia meritana)* continued to seriously defoliate (in combination with western spruce budworm) white fir on the west side of La Veta Pass (Pass Spring Creek Drainage). Detection reports indicate this insect is spreading both south and west from the original outbreak.

(8) Zimmerman pine moth *(Dioryctria zimmermani)* was found in a Phillips County windbreak and numerous unconfirmed reports of infested ball and burlap stock (imported from Nebraska?) have been received from Front Range nursery operators.

DISEASES

(1) Dutch elm disease (DED) *(Ceratocystis ulmi)* occurred at a slightly lower level state-wide (approximately 2,000 American and other elms killed) than in 1976. It was confirmed in one additional county, Cheyenne, and in the following additional towns: Sugar City (Crowley County), Olney Springs (Crowley County), Fowler (Otero County), Palmer Lake (Douglas County), and Portland (Fremont County).

CSFS increased the number of elms surveyed in 1977.

Currently, 43 municipalities and counties are considered to have active or effective DED programs. These areas are to be commended for their efforts, especially in the prompt removal of confirmed DED trees and/or broodwood.

Pheromone trapping of *Scolytus multistriatus* continued on a city-wide basis in Fort Collins for the third summer in 1977. Over 2 million beetles were caught. Positive cases of DED in the city declined slightly from 1976. No conclusions about the net worth of trapping are possible at this time, and the continuation of trapping in 1978 is undecided.

Colorado was recently chosen for funding within the USFS' new DED Control Demonstration Program. Under the guidance of CSFS, four municipalities (Eaton, Greeley, La Junta and Yuma) will receive assistance in implementing intensive, integrated DED programs. The goal is that they serve as demonstration communities state-wide and nationally.

(2) 1977 was apparently an "up" year for fireblight along the East Slope and a normal or low-incidence year on the West Slope.

(3) Dwarf mistletoes *(Arceuthobium vaginatum* subsp. *cryptopodum, A. americanum, A. cyanocarpum, A. divaricatum and A. douglasii)* continue to cause considerable growth loss and limited top-kill/mortality to pines and Douglas-fir throughout the state.

(4) Black stain root disease *(Verticicladiella wagenerii)* damaged pockets of West Slope pinon at levels similar to 1976.

(5) Thyronectria canker *(Thyronectria austro-americana)* incidence increased on ornamental honeylocust along the Front Range. This disease, which occasionally has led to tree mortality, should be considered more seriously during development of future city planting plans.

INSECT AND DISEASE CONDITIONS

The following section details Colorado insect and disease situations taxonomically by causal organism. Well-known locations are given without county designation. For other locations, the appropriate county is given in parentheses.

The approximate format for each pest is: most serious or extensive situations listed first and other situations follow in order of decreasing impact.

Readers interested in pest conditions for a given geographic area are referred to Appendix I where all listings for each county are given. Also see Appendix II for a listing of pests by tree host.

I. FOREST INSECTS

BEETLES --

A. Bark Beetles

(1) Mountain pine beetle *(Dendroctonus ponderosae)*

In 1977, 90,362 infested trees were treated in 48 Designated Control Areas (DCAs) covering a total of 331,562 acres. Details of these accomplishments are shown in Table 1.

Program-wide treatment efficiency was 85.2 percent, and ranged from 36 to 100 in individual units. CSFS internal standards call for careful examination of DCAs not treated to at least 80 percent level to determine reasons for the low effectiveness. Of the 48 DCAs, only six did not make that minimum, while nine were over 95 percent and 30 were 90 percent or better. Decision to either drop or modify the six DCAs will be made before the 1978 operating season.

To determine the efficiency of chemical treatment method used, each district involved conducted kill checks in each DCA. These checks were conducted on randomly-selected logs or piles two weeks after application of chemical. In all cases checked (open spraying or fumigation under plastic), beetle mortality exceeded 90 percent.

During the year, several changes in DCAs were made: Ute Pass DCA was canceled because the Pike National Forest could not join the effort; Gold Hill and South Turkey Creek DCAs were dropped due to lack of public interest and/or effort. Granby-Hot Sulphur Springs area was dropped for a variety of reasons, although CSFS harvest/salvage efforts are continuing in that area. Wagon Tongue in Park County, Sunshine in Boulder County and Crystal Lakes in Larimer County were added in 1977. Many DCAs were consolidated to make more manageable field units (see Table 1), and others had acres added or subtracted to arrive at more logical boundaries.

Twenty-nine DCAs had some stands (total 3,400 acres) placed under forest management with prescriptions designed to lessen the future hazard of MPB. This acreage is low but shows a trend in public attitudes towards accepting this concept. Hopefully, the Front Range Vegetation Management Pilot Project will show results that will stimulate public awareness and acceptance of preventive management techniques.

Table 1
MPB Control -- 1977
Accomplishment by DCA

District	DCA Name	County	Total Infested	Total Treated	Total Acres	Percent Efficiency
Golden	Blue Mountain	Jefferson	1443	1382	737	96
Golden	Brook Forest	Jefferson	345	331	398	96
Golden	Coal Creek	Jefferson	5953	5587	4608	94
Golden	Conifer Meadows	Jefferson	1365	942	2717	69
Golden	Double-Aspen[a]	Jefferson	1119	1003	3165	90
Golden	Evergreen Highlands (North Turkey Creek)	Jefferson	631	575	1350	91
Golden	Evergreen Park Estates	Jefferson	1728	1621	2925	94
Golden	Indian Hills	Jefferson	1101	960	2583	87
Golden	Johns-Manville	Jefferson	382	358	1194	94
Golden	Kings Valley	Jefferson	70	62	888	89
Golden	Lookout Mountain	Jefferson	2038	1622	8193	80
Golden	North Evergreen Strip[b]	Jefferson	6102	5901	8325	97
Golden	Phillipsburg	Jefferson	846	706	1437	83
Golden	Rossman Gulch (Rye)	Jefferson	214	192	303	90
Golden	Twin Spruce	Jefferson	909	830	468	91
Golden	Upper Bear Creek	Jefferson	4923	4909	1438	99
Golden	North Park County[c]	Park	2148	1770	12321	83
Golden	Elk Falls	Park	187	185	548	99
Golden	Circle K-Greystone	Clear Creek	2356	2346	1829	99
Golden	Clear Creek East	Clear Creek	261	247	858	95
Golden	Evan's Ranch	Clear Creek	241	169	3200	71
Golden	Floyd Hill	Clear Creek	155	141	3002	91
Golden	Golden Watershed	Clear Creek	381	320	797	84
Golden	Gilpin Lakes[d]	Gilpin	305	300	4216	98
Canon City	Buena Vista	Chaffee	4419	4125	14000	93
Canon City	Spruce Basin	Fremont	1168	912	4760	78
Fort Collins	Estes Valley	Larimer	4189	3645	19405	87
Fort Collins	Tahosa Valley	Larimer	168	62	2010	37
Fort Collins	Pinewood Springs	Larimer	585	466	1107	80
Fort Collins	Pinewood Lake	Larimer	108	98	230	91
Fort Collins	Harriman	Larimer	560	521	1135	93
Fort Collins	Crystal Lakes	Larimer	943	833	6165	88
Boulder	Allenspark	Boulder	10064	8606	14080	86
Boulder	Blue Mountain	Boulder	327	326	1920	100
Boulder	Boulder Heights	Boulder	2767	2528	1458	91
Boulder	Crestview-Lake of Pines	Boulder	84	73	267	87

Table 1 (cont.)

District	DCA Name	County	Total Infested	Total Treated	Total Acres	Percent Efficiency
Boulder	Magnolia	Boulder	5081	4825	2798	95
Boulder	Nederland	Boulder	5315	4387	6074	83
Boulder	Olde Stage	Boulder	447	410	744	92
Boulder	Pinebrook Hills	Boulder	1162	1088	1388	94
Boulder	Sugarloaf	Boulder	4766	4650	1027	98
Boulder	Sunshine	Boulder	2463	2242	566	91
Boulder	St. Vrain	Boulder	3286	2972	14080	90
Boulder	Tall Timbers	Boulder	605	605	165	100
Woodland Park	Black Forest	El Paso(e)	21216	13816	140000	65
Woodland Park	Perry Park West	Douglas	442	408	4480	92
Woodland Park	Woodman Valley	El Paso	437	400	12800	92
Woodland Park	Wagon Tongue	Park	772	532	13160	69

(a) Consolidates two fourth-year areas, Aspen Park and Doubleheader.

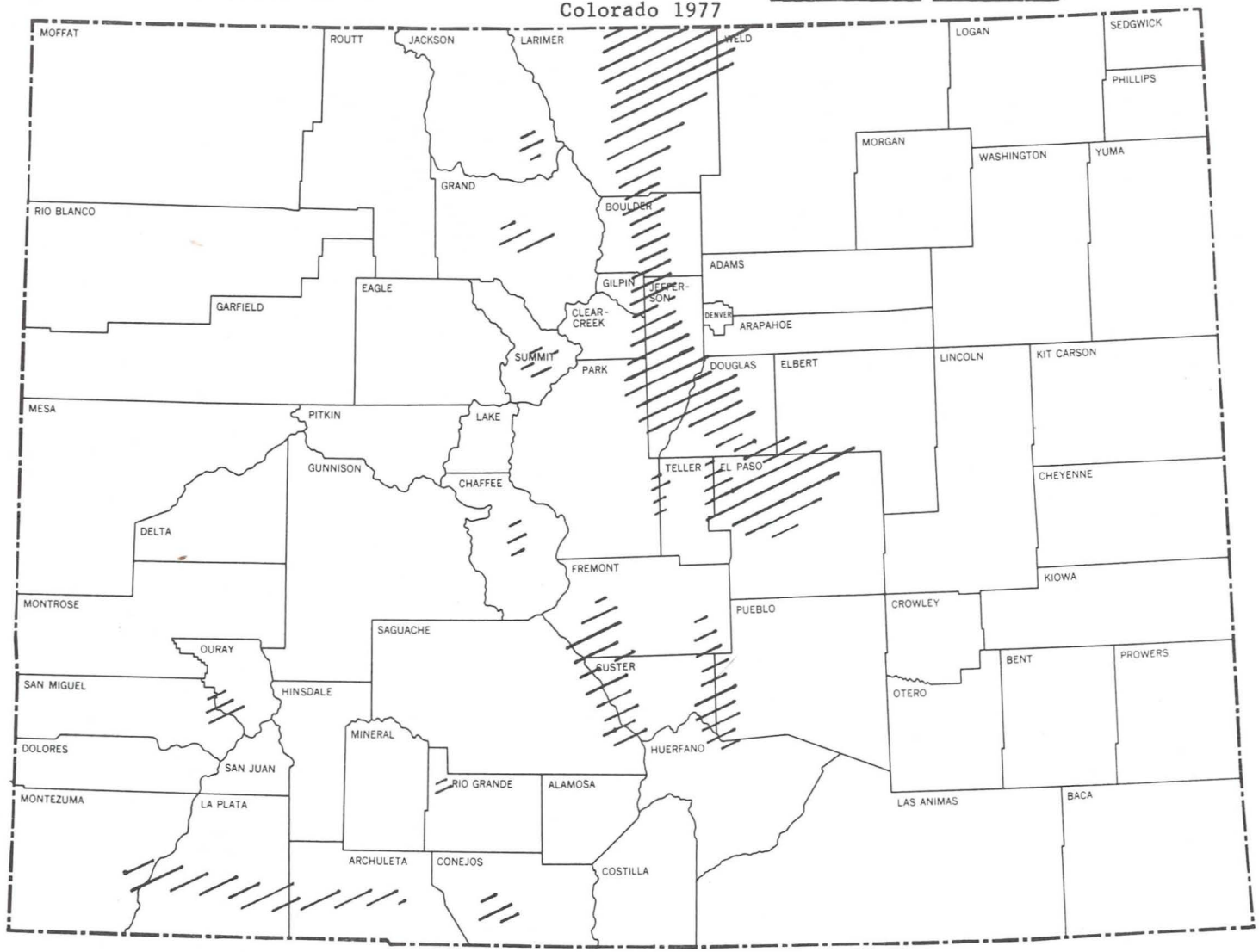
(b) Consolidates second-year area El Rancho with other units which are in fourth year.

(c) Consolidates second-year areas Deer Creek and Pine Junction and third-year area Burland plus certain adjacent and in between lands (Roland Valley, etc.).

(d) Consolidates Dory Lakes and Missouri Lakes area.

(e) El Paso County 71%, Elbert County 15%, and Douglas County 14%.

General Distribution Of Mountain Pine Beetle (Dendroctonus ponderosae) Colorado 1977



Scale of Miles
0 10 20 30 40 50

The Front Range Project covers approximately 34,000 acres in Boulder County. It is a cooperative effort involving private, City of Boulder, county, state and federal lands. The Colorado State Forest Service is coordinating the total effort aimed at demonstrating the feasibility of management to retain or enhance recreation, wildlife, scenic and residential values by reducing losses to MPB and other insects and diseases and reducing wildfire hazard.

Populations of MPB apparently are increasing on the southern end of the Front Range in Custer, Huerfano, and Las Animas Counties and in the southwest corner of the state. These areas will be closely monitored in 1978 to determine needs for direct action.

(2) Douglas-fir beetle *(Dendroctonus pseudotsugae)*

This insect is currently at a relatively low incidence level, but may be increasing in some local areas. As damage by the western spruce budworm and the drought continue to intensify, endemic populations may flare up. Pockets of Douglas-fir mortality were discovered at Douglas Pass (Garfield County) and north of DeBeque (Mesa County). East of the Great Divide, increased mortality was noted along the middle stretches of the Cache La Poudre Canyon (Larimer County) where several pockets of five to 50 trees have died. Increased mortality also occurred in the South St. Vrain Canyon (Boulder County). Other minor locations are listed below.

Location	County	Comments
Kirby Ranch	Garfield	Scattered individuals
Estes Park	Larimer	Scattered individuals
Pinewood Springs	Larimer	Scattered individuals
North Fork Escalante Creek	Delta	Scattered individuals
Tercio	Las Animas	On CF&I land

(3) Spruce beetle *(D. rufipennis)*

No active outbreaks of any consequence were confirmed on state or private lands in 1977. High winds in May resulted in blowdown of mixed conifers, including 100 acres of Engelmann spruce on private land in the Muddy Pass area (Jackson County). Salvage operations were initiated and will be continued in conjunction with the Bureau of Land Management (BLM). The area will be monitored for possible build-up of spruce beetle populations.

A June aerial survey in cooperation with the USFS resulted in a report of groups of up to 200 recently-killed trees west of Cuchara Pass (Huerfano and Las Animas Counties).

Two smaller groups were subsequently ground-checked. Mortality was due to fir engraver on white fir. The other groups will be checked for spruce beetle next summer.

(4) Roundheaded pine beetle *(D. adjunctus)*

Three infestations of this beetle were discovered in southern Colorado in large-diameter (over 20") ponderosa pine. All infested trees were associated with MPB-infected stands.

Location	County	Comments
Stonewall	Las Animas	Eight trees (one tree co-inhabited with MPB)
Mancos	Montezuma	Several small groups
Pagosa Springs	Archuleta	Several (one tree co-inhabited with MPB)

Death of large pines in the Pagosa area has occurred for several years with no apparent primary cause. Water table changes, ips beetles, MPB, roundheaded beetle, and root rots may all be involved. Plans for 1978 include further evaluation of this problem.

(5) Western pine beetle *(D. brevicomis)*

No confirmed reports were received in 1977, although this insect is known to occur in extreme western, southwestern, and south-central Colorado in over-mature, large-diameter ponderosa pine.

(6) Red turpentine beetle *(D. valens)*

This insect occurs throughout the pine forests of Colorado. It seldom causes mortality by itself, but in 1977 notable infestations occurred in fire-damaged stands on the Front Range and in the Durango area (on San Juan National Forest) northwest of Stoner (Montezuma County), and in Wet Canyon (Las Animas County) where it was associated with thinning operations.

Red turpentine beetle also frequently colonizes trees initially attacked by MPB. This situation often causes confusion and concern among landowners. Spring and early summer flights are attributed to MPB, thus leading to frantic calls for accelerated MPB treatment programs; populations in stumps are often mistaken for MPB and people then call for, and expect, needless treatment of these stumps.

Red turpentine beetles were found in association with black stain root disease of pinon pine (see page 39), and may be involved in long-distance spread of the causal fungus.

(7) Fir engraver *(Scolytus ventralis)*

Extensive defoliation of white fir by western spruce budworm and white fir needle miner in the Pass Spring Creek Drainage (Huerfano County) rendered approximately 8,500 acres susceptible to the fir engraver. In addition to mortality attributed to the defoliators, subdivision development in the valley resulted in large quantities of fresh slash created through road and firebreak construction that is infested with fir engraver. Population build-up and associated effects on weakened trees in this area will be evaluated in 1978. Other locations for this insect are:

Location	County	Comments
Cuchara Pass	Huerfano-Las Animas	Small pockets of dead white fir
Mt. Mestas	Huerfano	Southeast slopes
Tercio	Las Animas	Fire-damaged white fir
Stonewall	Las Animas	Fire-damaged white fir
Lone Cone	San Miguel	On National Forest land
Mt. Sneffels	Ouray	On National Forest land

(8) Lesser European elm bark beetle *(Scolytus multistriatus)*

This is the main vector of Dutch elm disease (DED) in Colorado. (The native elm bark beetle *(Hylurgopinus rufipes)* has never been found here.)

City-wide pheromone trapping of LEEBB continued in Fort Collins for the third consecutive summer. This project, conducted in cooperation with the USFS Northeastern Forest Experiment Station, Delaware, Ohio, has a goal of significantly reducing the number of beetle-vectored cases of DED in Fort Collins.

The following table summarizes significant data since 1974. Note that trapping during a given year not only affects DED incidence in late summer of that year, but also the following year.

Year	# Traps	Approx. # S.m. Caught	Total # of DED Cases
1974	0	0	148
1975	2,200	1.5 MM	90
1976	685	2.0 MM	132
1977	650	(2.5 MM)*	108

* Estimated from partial data available at time of report.

(9) Ips or engraver beetles (several species including *Ips pini*)

Normally considered secondary insects, ips beetles apparently caused an increased amount of tree mortality on their own in 1977. This increase appears directly related to MPB activity and also to the current drought.

As such, more attention should be given to: (1) proper slash management to prevent significant ips build-ups, and (2) proper planting of ornamental pines (especially ball and burlap stock). Fall and winter cutting of MPB-infested trees destined for treatment should be encouraged to reduce the amount of ips breeding material.

Reports of agressive ips activity in pines are listed:

Location	County	Comments
Sunshine	Boulder	Ponderosa
Mountain Meadows	Boulder	Ponderosa
Nederland	Boulder	Lodgepole
Pinewood Lake	Larimer	Ponderosa
Pinewood Springs	Larimer	Ponderosa
Harriman Heights	Larimer	Ponderosa
Estes Park	Larimer	Ponderosa
Soda Creek	Jefferson	Lodgepole
Wet Canyon	Las Animas	Ponderosa
Killian Ranch	Elbert	500 sapling ponderosa killed (residual from thinning)
(scattered)	Mesa	Pinon (with *V. wageneriі*)
(scattered)	Chaffee	Pinon (with *A. mellea*)

(10) Miscellaneous bark beetles

(a) Ash bark beetles (*Leperisinus* spp. including *californicus*) were found killing over half the crowns of green ash in a windbreak of the CSFS Nursery in Fort Collins. Other reports of branch killing came from Roselawn Cemetery in Fort Collins, and Grand Junction (on dead or declining blue ash). This insect has caused tree mortality in South Dakota, but none was confirmed in Colorado in 1977.

(b) *Hylurgops* spp. were commonly found colonizing the lower bole of MPB-infested pines. These insects do no harm other than they are often mistaken by landowners and others for MPB. Since *Hylurgops* can be actively flying months before the peak MPB emergence, this mis-identification causes undue concern for participants in MPB treatment operations.

A population of *Hylurgops* sp. was observed May 12 in the Big Thompson Canyon west of Loveland (Larimer County) being attracted in large numbers to pines damaged by the flood of July 31, 1976. (These same trees supported a variety of other primary and secondary insects including MPB, *Ips* spp., twig beetles, and wood borers.)

B. Wood Borers

(1) Roundheaded borers (Cerambycidae)

As a group, these do little primary damage to trees. Borer "problems" are primarily a matter of education of those who come in contact with them. Prevention of borer activity is far more advisable than attempted control once borers are established.

(a) The poplar borer *(Saperda calcarata)* caused bleeding wounds and stem weakening to small stands of aspen on Rabbit Ears Pass (Routt County), in South St. Vrain Canyon (Boulder County), and on Martin-Marietta land west of Littleton (Jefferson County).

(b) Numerous calls were received regarding borers in firewood and houselogs. An information sheet regarding insects in firewood was prepared for distribution. The houselog problem is one of consumer understanding and awareness.

Many logs are borer-infested *(Monochamus* spp., *Acanthocinus* spp., *Stenocorus* sp., etc.) prior to purchase. Care should be taken either to buy borer-free logs or to fumigate infested logs before cabin construction. The nuisance and limited structural damage borers do is most difficult to stop once the logs are in place.

(2) Flatheaded borers (Buprestidae)

Like those of most cerambycids, buprestid attacks often require host pre-conditioning. Thus, occurrence of these insects is more properly considered a symptom of problems instead of problems themselves.

(a) An unidentified buprestid (possibly *Chrysobothris* sp.) was found causing individual branch mortality and flagging in an extensive area of Utah juniper along S.R. 141 approximately five miles southwest of Whitewater (Mesa County). Initial attacks were made at branch whorls much in the manner of a twig pruner. No old, pruned branches littered the area, but infested branches were easily broken from the tree. Samples are being reared in Fort Collins for identification.

(b) *Agrilus difficilis* was found commonly associated with thyronectria canker in ornamental honeylocusts. It is not known if this insect is involved as an accidental vector of the causal fungus.

(c) The common buprestid genera found in MPB-killed ponderosa pine along the Front Range include *Buprestis, Chalcophora, Melanophila, Dicerca* and *Chrysobothris*. These cause "problems" similar to the cerambycid situations mentioned earlier in firewood and houselogs.

C. Weevils (Curculionidae)

(1) Lodgepole terminal weevil *(Pissodes terminalis)*

This insect damaged saplings in the Buckhorn Creek Drainage of the Roosevelt National Forest (Larimer County).

The only other report of LPTW came from the Aspen Park parcel of the Denver Mountain Park System (Jefferson County) where it damaged five pole-size pines.

(2) White pine weevil *(Pissodes strobi)*

No serious damage was reported. This insect is known to occur in mature Engelmann and blue spruce along Buckhorn Creek (Larimer County), in a blue spruce windbreak at the St. Benedict Monastery near Snowmass (Pitkin County), and probably at scattered locations throughout the state on ornamental spruce (based on detection records from past years).

(3) Strawberry root weevil *(Brachyrhinus ovatus)*

Found killing a block of over 500 containerized Douglas-fir seedlings in the CSFS Fort Collins Nursery.

(4) Other weevils:

(a) A *Conotrachelus* weevil was found in Larimer and Boulder Counties doing an undetermined amount of damage to ponderosa pine cones.

(b) Weevils are thought to be causing very minor damage to ponderosa pine foliage along the Front Range. Feeding injury is basically of two types: (1) irregular scallop-like bites taken from one side of needles, and (2) long strips removed from sides of needles. Both an unidentified broad-nosed weevil and a blue *Magdalis* weevil were collected from foliage.

D. Leaf Beetles (Chrysomelidae)

(1) Elm leaf beetle *(Pyrrhalta luteola)*

Most CSFS Districts reported defoliation by this insect "about the same" or "up" from 1976 levels, especially in communities at lower elevations (below 6,000'). Hardest hit areas were small eastern communities where Asiatic elms make up the primary tree cover. Specific communities or areas noted were Amherst (Phillips County), Commerce City (Adams County), Bennett (Adams County), much of Jefferson County, Towner (eastern Kiowa County), Swink (Otero County), Cortez (Montezuma County), and most of Weld County.

(2) Cottonwood leaf beetle *(Chrysomela scripta)* and related species caused minor defoliation to willows and cottonwoods along water courses throughout the state.

(3) Alder flea beetle *(Altica ambiens)* also defoliated alder along streams, particularly in the southern Front Range, causing little or no permanent damage.

BUTTERFLIES AND MOTHS --

E. Defoliators

(1) Whites and sulfurs (Pieridae)

(a) Pine butterfly *(Neophasia menapia)*

An outbreak has existed on approximately 100 acres of transition-zone ponderosa pine seven miles north-northwest of Calhan (Elbert County) since 1974. Though not formally evaluated in 1977, a visit to the area in June indicated a much lower population in the middle of the area than in 1976. However, both northward and southward spread in 1977 from the known 1976 limits is suspected and another evaluation is planned for 1978. No mortality had occurred as of June 1976, although many trees were heavily defoliated and weakened.

Adult butterflies were seen and/or collected from the following Front Range locations: Rist Canyon and Horsetooth Ridge (Larimer County), Colorado College and Broadmoor sections of Colorado Springs, Monument/Palmer Lake area, Banning/Lewis Ranch five miles east of Colorado Springs and portions of the Black Forest (all El Paso County).

Based on these locations, it is probable an endemic population existed throughout much of the Front Range in 1977.

(2) Giant silk moths (Saturniidae)

(a) Pandora moth or near relative *(Coloradia pandora* or *doris)*

No outbreaks were detected. Larval specimens representing very light populations were collected from Horsetooth Ridge (Larimer County) and the Banning/Lewis Ranch five miles east of Colorado Springs (El Paso County).

(3) Tent caterpillars (Lasiocampidae)

(a) Western tent caterpillar *(Malacosoma californicum)*

Sizable outbreaks again occurred in the Spanish Peaks region of the southern Front Range where aspen suffered near total defoliation for, in some cases at least, the third consecutive summer. High tent caterpillar population areas were: (1) the Pass Spring Creek Drainage (Huerfano County) west of La Veta Pass where an estimated 7,000 acres were involved. (An aspen, 25' in height, showing typical defoliation contained 106 tents during a mid-June visit to the area), (2) the east side of Apishapa Pass (Las Animas County) where an estimated 3,000-4,000 acres suffered 50-100 percent defoliation in the 8,300' to 10,200' elevational range, and (3) the lower western slopes of La Veta Pass where individual groves on both sides of S.R. 160 sustained up to 90-95 percent defoliation.

By July 27, all stands, except those at higher elevations of the Apishapa Pass outbreak and certain individual groves along Pass Spring Creek, were putting out a second set of leaves. Some groves have displayed this resiliency for three consecutive summers. In view of this, it is felt the tent caterpillar is not doing extensive permanent damage although individual trees and groves may die, top-kill, or succumb to future pest complexes.

A heavy tachinid fly population was noted within the Apishapa Pass outbreak (July 27). At that time, the predominant tent caterpillar stages were newly-emerged adults and pupae. The flies are thought to have been pupal parasites.

Smaller outbreaks in aspen were found south of Cumbres Pass (most damage appeared to be from previous years) on the Rio Grande and Carson National Forests (Conejos and Archuleta Counties, Colorado and Rio Arriba County, New Mexico), along S.R. 24 just west of Woodland Park (Teller County) to Wilkerson Pass (Park County), and in scattered locations on the Uncompahgre Plateau (Montrose County).

At lower elevations, western tent caterpillar was commonly found throughout the state on cottonwood, narrowleaf cottonwood, mountain-mahogany, chokecherry, and other hardwood and shrub species.

(b) Forest tent caterpillar *(Malacosoma disstria)*

This tentless defoliator of various hardwoods was common in ornamentals along the Front Range. Populations and subsequent defoliation were reportedly less than 1976 levels in Fort Collins and Denver.

A single collection from Gambel oak near Chromo (Archuleta County) constitutes an unusual record.

(c) Eastern tent caterpillar *(Malacosoma americanum)*

A single larva was collected from white willow along the South Platte River at Julesburg (Sedgwick County). This may closely represent the western limit of the eastern tent caterpillar's range at this latitude.

(d) Sonoran tent caterpillar *(Malacosoma tigris)* was collected in La Plata and Archuleta Counties on Gambel oak.

(4) Tiger moths (Arctiidae)

(a) Pine tiger moth *(Halisidota ingens)*

Only isolated light populations were found. Collections and/or reports on ponderosa pine came from Pinewood Lake (Larimer County), southeast of Sunshine (Boulder County), east of Kiowa (Elbert County), Kannah Creek Drainage (Delta County -- old damage), and seven miles southeast of Salida (Fremont County) on pinon pine. A single report of this insect on lodgepole pine came from Pole Hill near Masonville (Larimer County).

(b) Fall webworm *(Hyphantria cunea)*

Populations were observed on cottonwood and other lesser hosts throughout the state. Trees along

major water courses, including the South Platte in northeastern Colorado, the Arkansas from Buena Vista (Chaffee County) to La Junta (Otero County), and the Gunnison from Grand Junction to Delta (Delta County) sustained the highest population. Fall webworm is probably most conspicuous as a city or ornamental pest in Grand Junction and certain northeastern communities such as Sterling (Logan County), Yuma (Yuma County) and Wray (Yuma County). New location reports were received from Gardner and La Veta (both Huerfano County) and Boncarbo (Las Animas County). No reports of extensive permanent damage were received.

(5) Epipaschid moths (Epipaschidae)

(a) Pine webworm or relative *(Tetralopha* (?) sp.*)*

In June 1975, some frass-filled tents on mature ponderosa pine just east of Horsetooth Reservoir (Larimer County) were noticed. Prior to finding active larvae, no reliable diagnosis as to causal organism could be made. Larvae were collected in September 1976, and tentatively identified as pine webworm or a near relative. To date, we have had no success rearing adults. If it does prove to be pine webworm, this would represent a considerable westward range extension. According to available literature, the nearest infestations are in western Minnesota.

To date this insect has been found in four locations: around Horsetooth Reservoir (Larimer County), in Poudre Canyon about six miles east of Poudre Park (Larimer County), in Redstone Canyon (Larimer County), and just north of Lyons (Boulder County) along S.R. 36.

(6) Underwing moths (Noctuidae)

(a) American dagger moth *(Acronicta americana)*

This late-summer defoliator was found on silver maple in Berthoud, Loveland and Fort Collins (all Larimer County) doing minor damage. In Berthoud, they have been common enough the past few years to cause homeowner concern.

(7) Tussock moths (Lymantriidae)

(a) Douglas-fir tussock moth *(Orgyia pseudotsugata)*

Severe defoliation of mature Colorado blue spruce and a limited number of other conifers continued

in the Denver and Colorado Springs metropolitan areas (see maps for general 1977 distribution). In addition, limited damage was found near Evergreen (Jefferson County) and in Boulder (one tree).

A detection survey in both forest and urban areas, utilizing pheromone-baited traps, was conducted by USFS Region 2 personnel. Male moths were caught in Boulder, Longmont, Loveland and Fort Collins, while forest traps in Larimer, Boulder, Clear Creek, Gilpin, Jefferson and Douglas Counties all caught DFTM males.

The meaning of the forest catches is not clear. Perhaps they simply indicate the presence of an endemic population that has been present for years. The city catches indicate a real potential for ornamental damage and all Front Range communities from Laramie and Cheyenne, Wyoming to Pueblo should be on the alert for DFTM defoliation. In the event feeding caterpillars are detected, direct control may be advisable.

For details of the forest and urban DFTM trapping projects, see USFS, Rocky Mountain Region Detection Reports "5220-Colorado Front Range and Wyoming" and "5220-Boulder, Longmont, Loveland and Fort Collins, Colorado", both dated December 1977.

(b) A spruce tussock moth *(Dasychira* sp.*)*

As an interesting side light to the above DFTM pheromone trapping, specimens of an unidentified tussock moth species were caught at all forest trap locations. As many as 20 were caught on one trap. What these catches mean in terms of possible tree damage is not known.

(8) Wax moths (Gelechiidae)

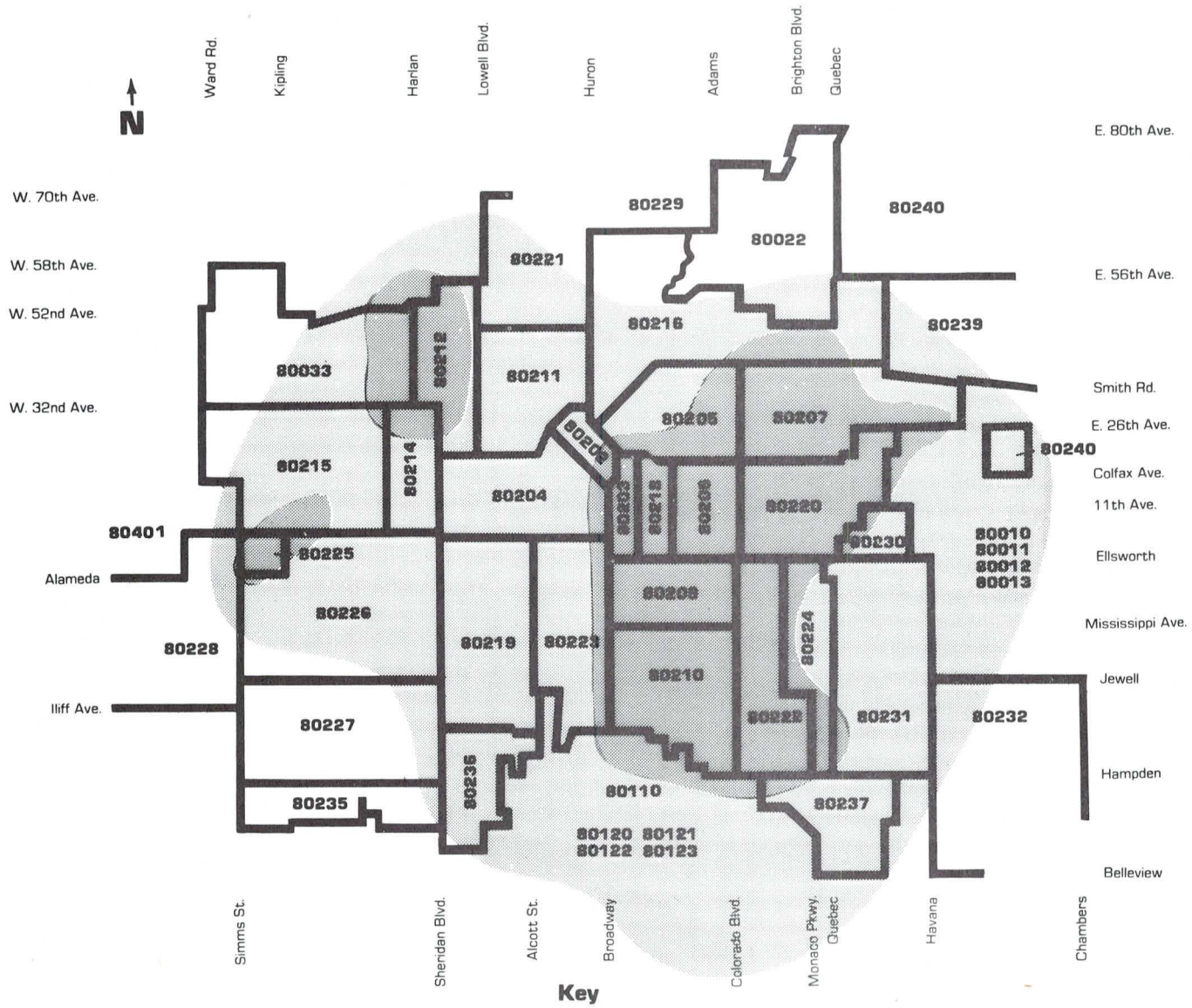
(a) Ponderosa needle miner *(Coleotechnites* sp.*)*

This insect is more widely distributed than previously supposed. Planned detection and evaluation efforts were conducted by CSFS personnel in June 1977, for parts of the Denver and Colorado Springs Districts.

The evaluation was conducted on June 9, 1977 in Douglas, Elbert and El Paso Counties (Black Forest area). High variation in needle miner population levels was the rule, both between stands and between trees within a given stand. For example, heavy local

DENVER

Tussock Moth by Zip Code.

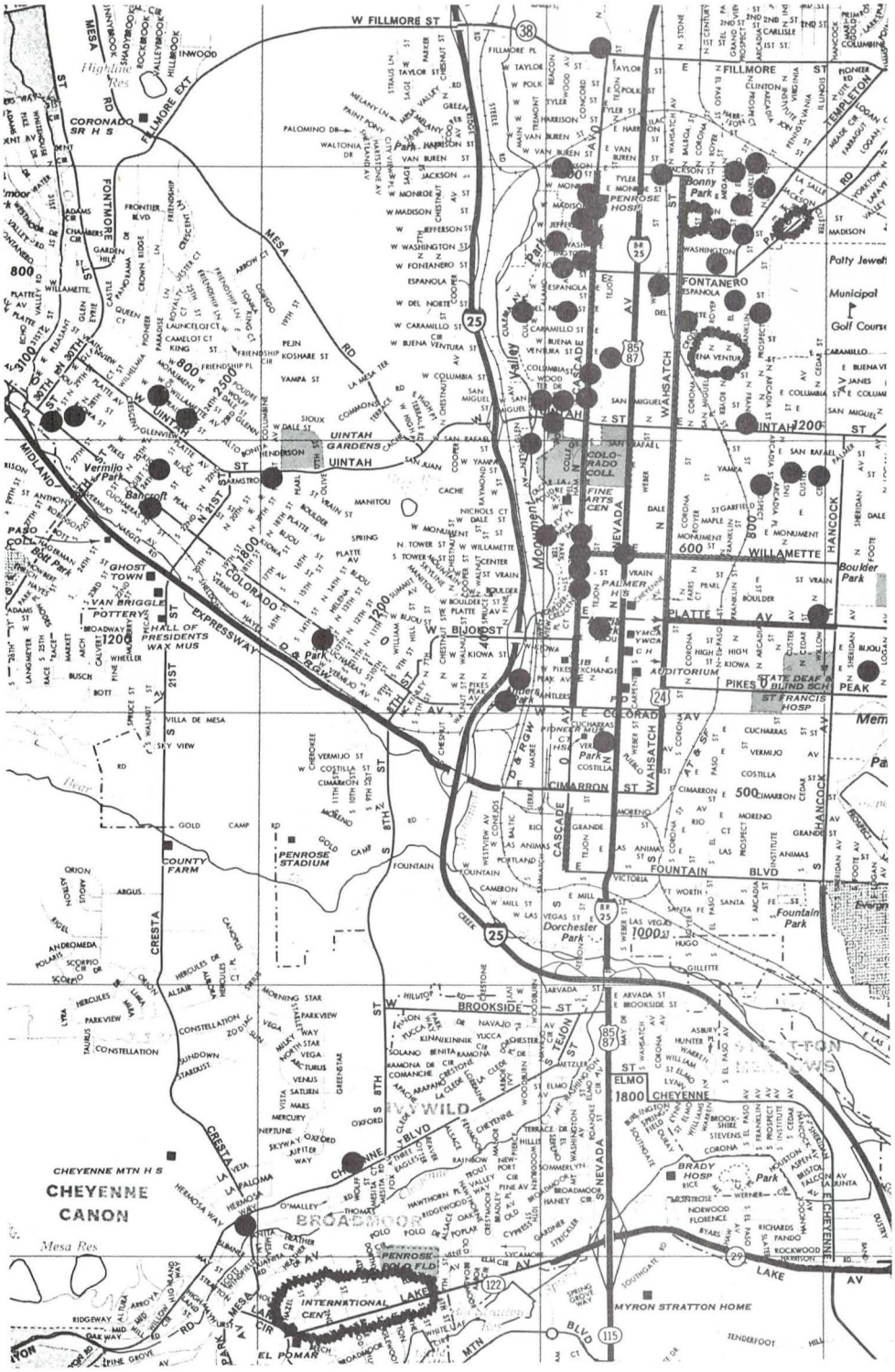


Key

Dark Gray - Area of major infestation in past years.
Light Gray - Additional areas of infestation; Potential for major infestation this year.

Map Based on data supplied by City Foresters and C.S.U. Extension.

COLORADO SPRINGS
DOUGLAS-FIR TUSSOCK MOTH
1977

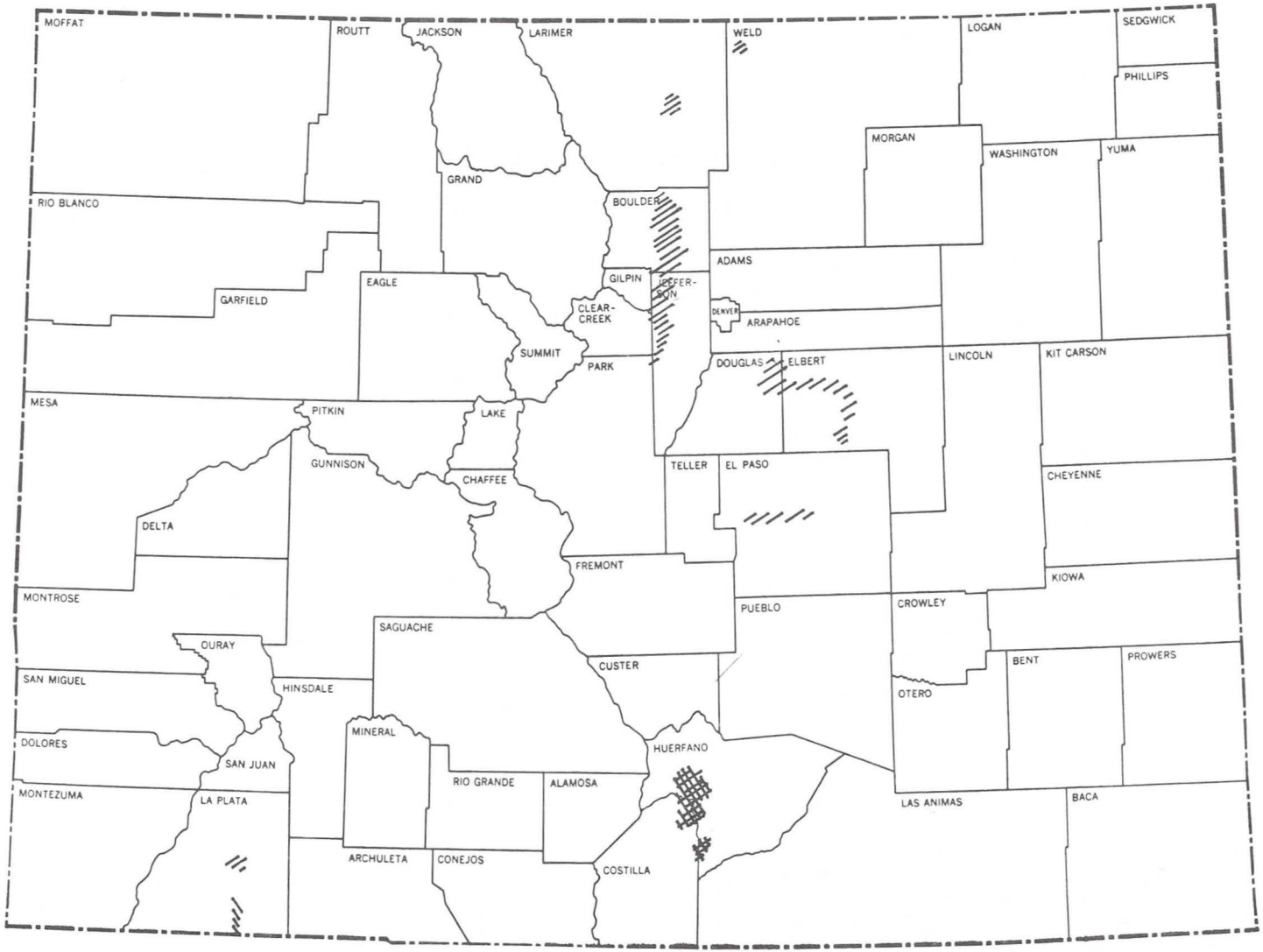


● -- Indicates single tree or small group incidence.

-- Indicates areas of general, heavy incidence.

Information compiled by City of Colorado Springs and Colorado State Forest Service.

General Distribution Of Selected Needle Miners
Colorado 1977



Scale of Miles
0 10 20 30 40 50

Ponderosa needle miner (Coleotechnites sp.)

White fir needle miner (Epinotia meritana)

Pinon needle miner (Coleotechnites sp.)

PNM populations were found at Elizabeth (western Elbert County), south of Hilltop (northeastern Douglas County), and southeast of Franktown (eastern Douglas County). Ranges of mined needles for samples taken from these three localities were: 2 - 73 percent, 3 - 82 percent and 0 - 54 percent, respectively. It was found that infestations involving less than 5-10 percent of a tree's needles could not be detected without close inspection. For this reason, the apparent rapid increase in PNM in recent years may be as much a function of improved detection as of significant population increases.

No obvious correlation could be made between degree of infestation and tree age, size, or site. Nor did the PNM areas exhibit a higher incidence of MPB than non-PNM areas.

Locations of other infestations are:

Location	County	Comments
Sugarloaf Mt.	Boulder	Heavy
South St. Vrain Canyon	Boulder	Heavy
Olde Stage	Boulder	Heavy
Flagstaff Mt.	Boulder	Heavy
Coal Creek Canyon	Jefferson	Heavy
Colorado Spgs. (city)	El Paso	Moderate
Carr	Weld	Light
Rist Canyon	Larimer	Light
Horsetooth Ridge	Larimer	Light
Fort Collins (city)	Larimer	Light
Left Hand Canyon	Boulder	Light
Lyons	Boulder	Light
Pinebrook Hills	Boulder	Light
Boulder Heights	Boulder	Light
Gold Hill	Boulder	Light
Russelville Gulch	Douglas	Light
Evergreen	Jefferson	Light
Bailey	Park	Light
Durango (10 miles south)	La Plata	Light

This insect generates a large number of landowner calls in Boulder, Jefferson, Douglas, and Elbert Counties. The needle browning is often confused with symptoms of MPB attack, and there is concern that trees are being made susceptible to MPB. Separating PNM damage from

that of MPB is fairly simple, but the increased susceptibility question is, as yet, unanswered. This relationship will be monitored in 1978. No control measures, silvicultural or chemical, are known.

See distribution map on page 22.

(b) Pinon needle miner *(Coleotechnites* sp.*)*

A moderate infestation was found by USFS personnel near Durango, 14 miles south of S.R. 160 along S.R. 550 (San Juan County, New Mexico). Later searching revealed light populations in southern La Plata County, Colorado, also along S.R. 550. Because of low host values this insect is not considered a problem.

See distribution map on page 22.

(9) Olethreutid moths (Olethreutidae)

(a) White fir needle miner *(Epinotia meritana)*

An outbreak, currently covering more than 9,500 acres, continued to seriously damage white fir in the La Veta Pass area (Huerfano County). Damage was first detected in 1972 on mixed ownerships of the Pass Spring Creek Drainage, and as of August 1977, severe defoliation, top-kill and mortality are widespread. Damage is actually attributable to a pest complex which includes WFNM, western spruce budworm and fir engraver. If nothing is done, estimates are that white fir mortality in the area could run as high as 75 percent by 1979.

Aerial surveys in 1977 indicated continued south and westward spread onto the Blanca Trinchera and Forbes Trinchera Ranches (both Costilla County). Light populations were detected on Cuchara Pass (Huerfano/ Las Animas County line) and west of Larkspur (Douglas County). Plans are to evaluate this entire pest complex in 1978, especially the extent of tree mortality and existing fir engraver levels.

See distribution map on page 22.

(10) Leaf roller moths (Tortricidae)

(a) Western spruce budworm *(Choristoneura occidentalis)*

Currently this insect is the most important tree defoliator in Colorado.

The most troublesome outbreak in terms of size and proximity to established population centers is in the Cuchara-Spanish Peaks area (Huerfano, Las Animas and Costilla Counties). In general, the infested acreage is in a band of mixed white fir/ Engelmann spruce/ Douglas-fir forest extending along the Sangre de Cristo Mountains from Hillside (Fremont County) south through Custer County to Cuchara and east through the Spanish Peaks (Las Animas County). Aerial spraying is tentatively planned by some homeowner groups for 1978.

Mature western spruce budworm larvae -- response to disturbance.

As the table below shows, WSBW occurs at varying population levels throughout the Front Range south through the Wet Mountain and Sangre de Cristo Ranges. Scattered infestations also exist on forested portions of the West Slope and in the Durango area (see general distribution map).

Location	County	Comments
Dry Gulch	Larimer	Moderate to heavy
Devil's Gulch	Larimer	Moderate to heavy
Kruger Rock	Larimer	Moderate to heavy
Sugarloaf	Boulder	Moderate to heavy
Flagstaff	Boulder	Moderate to heavy
Genesee	Jefferson	Moderate to heavy
Warren Peak	Jefferson	Moderate to heavy
Jarre Canyon	Douglas	Moderate to heavy
Wet Mountain	Custer	Moderate to heavy
Vallecito Resvr.	La Plata	Moderate to heavy
Cherokee Park	Larimer	Light to moderate

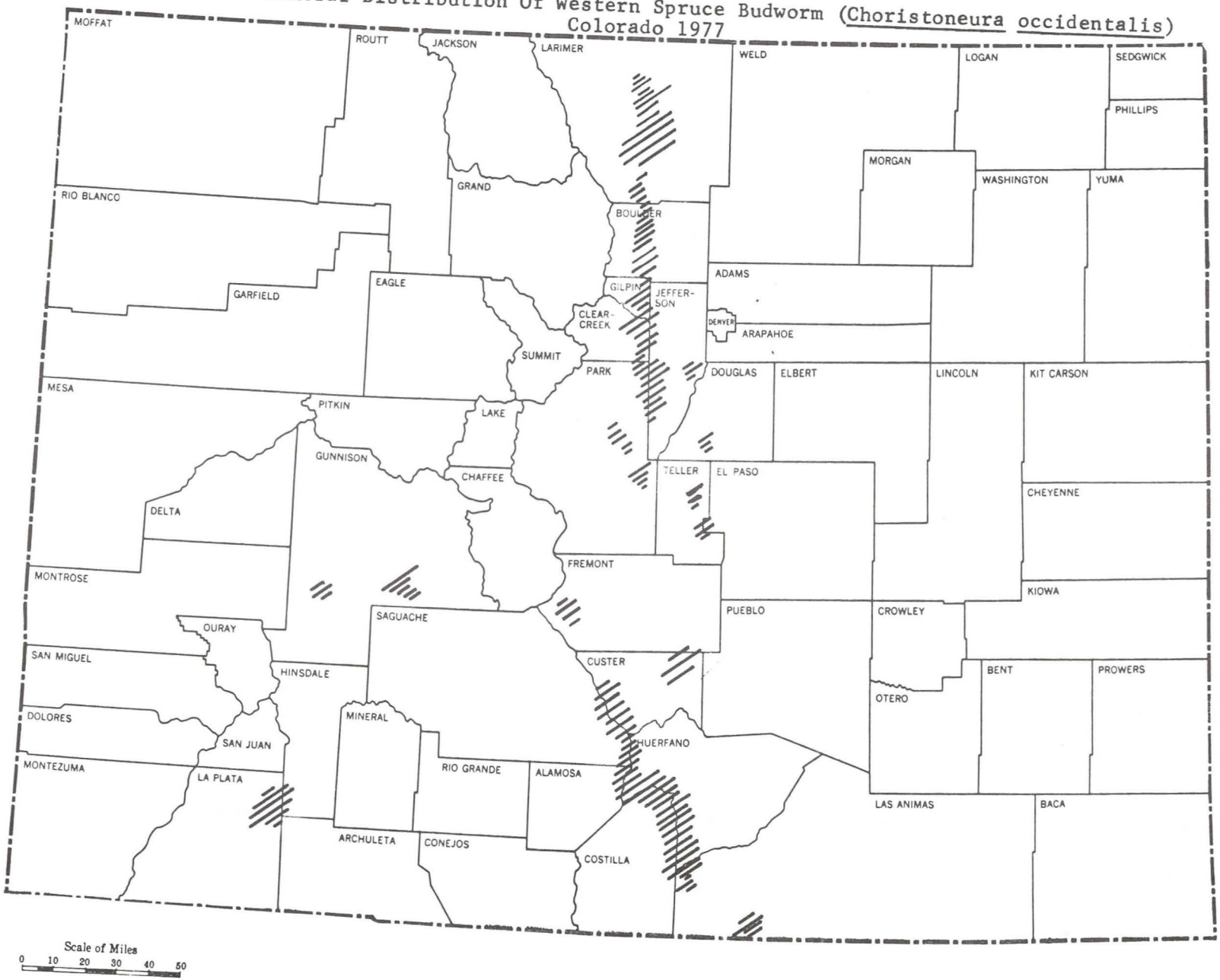
Location	County	Comments
Red Feather Lakes	Larimer	Light to moderate
Poudre Canyon	Larimer	Light to moderate
Lake Estes (east)	Larimer	Light to moderate
Magnolia	Boulder	Light to moderate
South St. Vrain Canyon	Boulder	Light to moderate
Central City	Gilpin	Light to moderate
Conifer	Jefferson	Light to moderate
Evergreen	Jefferson	Light to moderate
Perry Park	Douglas	Light to moderate
Lake George	Park	Light to moderate
Tarryall Mts.	Park	Light to moderate
Woodland Park	Teller	Light to moderate
Howard	Fremont	Light to moderate
Fisher's Peak	Las Animas	Light to moderate
Raton Pass	Las Animas	Light to moderate
Forbes Trinchera Ranch	Costilla	Light to moderate
Mosca Pass	Saguache	Light to moderate
Muddy Creek	Gunnison	Light to moderate
Poison Gulch	Gunnison	Light to moderate
Rock Creek	Gunnison	Light to moderate
Curecanti Resvr.	Gunnison	Light to moderate
Sterling	Logan	On ornamental spruce

Aerial control operations were privately contracted during 1977 in Jefferson County (Genesee and Evergreen infestations), Estes Valley and the Vallecito Reservoir area. These covered relatively small areas (400 to 800 acres each), and were carried out primarily to protect aesthetic and recreational values. (Results of the Jefferson County Project are summarized below.)

Economic losses were sustained by Christmas tree growers in infested areas. Douglas-fir was reported in short supply at lots in Denver, thus inflating prices. Growers in the Wet Mountains, near Sedalia (Douglas County), and south of Vallecito Reservoir reported serious damage to crops scheduled for December 1977 sale.

Two WSBW permanent study plots were established, one near Perry Park (Douglas County) and one on the Forbes Trinchera Ranch. (Data collected during 1977 is summarized below.) A third plot is to be established in the Estes Valley during 1978. The long-term goal of these plots is primarily to facilitate making defoliation estimates from early-instar larval counts. Effects of cumulative defoliation are also to be documented.

General Distribution Of Western Spruce Budworm (Choristoneura occidentalis)
Colorado 1977



Jefferson County Control

A total of 605 acres just east of Evergreen were aerially sprayed on June 30, 1977. Specific spray blocks were named Genesee, Lone Peak and Bear Mountain. Sevin-4-Oil (R) was applied at a rate of one quart active ingredient per acre. In this cooperative effort, funding came from Jefferson County with sampling assistance and technical advice from the Colorado State Forest Service. The job was contracted with a Fort Collins helicopter firm at a cost of $5.85 per acre. Egg mass counts were performed by USFS, Region 2 personnel.

SUMMARY DATA

Sample Locations	# Branches Sampled	# Old Egg Masses	# New Egg Masses	Ratio of Old Egg Masses To New	% Reduction
Bear Mountain	8	24	7	1:0.29	71
Lone Peak	10	8	3	1:0.38	62
Genesee	10	30	23	1:0.62	38
Total Sprayed	28	62	33	1:0.53	47
Unsprayed Checks	8	23	20	1:0.87	13

Permanent Plot Information 1977

(1) Perry Park West (PPW)

Location: R68W, T9S, NE¼ of Section 28 (approximately seven miles WNW of Larkspur in Douglas County).
Hosts: Douglas-fir and white fir.
Egg mass sampling date: August 12, 1977.
Defoliation rating: Light.

(2) Forbes Trinchera Ranch (FT)

Location: R70W, T30S (along West Indian Creek approximately four miles west of Harrison Peak or 13.5 miles due east of Fort Garland in Costilla County).
Hosts: Douglas-fir, Engelmann spruce, corkbark fir and white fir.
Egg mass sampling date: August 18, 1977.
Defoliation rating: Light to moderate.

SUMMARY DATA

Sample Locations	# Branches Sampled	# Old Egg Masses	# New Egg Masses	Ratio of Old Egg Masses To New	% Reduction
Perry Park West	50	76	61	1:0.80	20
Forbes Trinchera Ranch	49	158	38	1:0.24	76
Totals	99	234	99	1:0.42	58

(b) Pine budworm *(Choristoneura lambertiana ponderosana)*

Primarily a pest of ponderosa (and rarely limber) pine, this defoliator was most common along highways in the major river canyons of the northern Front Range (Rist, Poudre, Big Thompson, South St. Vrain, Boulder and Coal Creeks). No mortality has been observed, although complete defoliation of new growth, branch deformity, and related maladies have occurred.

Location	County	Comments
Koral Heights (Estes Park)	Larimer	Visible, light to moderate damage
Allenspark to Meeker Park	Boulder	Visible, light damage
Riverside	Boulder	Visible, light damage
Bergen Park	Jefferson	Visible, light to moderate damage
Doubleheader to Bailey	Jefferson / Park	Along U.S. 285, moderate damage
Jarre Canyon	Douglas	Visible, light damage
Westcreek	Douglas	Visible, light damage
Monument-Palmer Lake	El Paso	Visible, light damage
Cascade-Woodland Park	Teller	Visible, light to moderate damage

(c) Ugly-nest caterpillar *(Archips cerasivoranus)*

The only outbreak of any consequence was nine miles west of Toponas (Routt County) where 60 acres of aspen saplings and associated understory species (chokecherry and bitterbrush) were severely defoliated during June.

Other reports of lesser damage came from Rist Canyon (Larimer County), and Jarre Canyon (Douglas County).

(d) Miscellaneous poplar leaf rollers (including the genera *Archips* and *Choristoneura*)

Aspen in the mountains and cottonwood along lower elevation watercourses were hosts for a variety of leaf rolling and leaf tying moth larvae. Included in this group are the large aspen tortrix *(Choristoneura conflictana)*, fruit tree leaf roller *(Archips argyrospilus)*, and oblique-banded leaf roller *(Choristoreura rosaceana)*. Relatively minor midsummer damage was done in most instances. Heaviest defoliation reports came from Johnstown (Weld County), Sterling (Logan County) and Julesburg (Sedgwick County).

(11) Leaf blotch miners (Gracillariidae)

(a) Cottonwood blotch miner *(Phyllonorycter* sp.*)*

This insect resulted in a brown, unsightly appearance of cottonwoods in eastern Colorado by late summer. While of little economic importance, it generates a great deal of interest on the part of affected landowners. Much of Weld County's cottonwood resource was conspicuously affected.

(12) Miscellaneous defoliators

(a) Tiger swallowtail *(Papilio* sp.*)* caterpillars were common on green ash state-wide.

(b) Spiny elm caterpillars *(Nymphalis antiopa)* defoliated individual elms, especially on the Front Range.

(c) An *Argyrotaenia* sp. was found mining Rocky Mountain juniper along S.R. 115 northeast of Penrose (Fremont County).

(d) Lilac leaf miner *(Gracillaria syringella)* was common on ornamentals.

F. Tip and Shoot Moths

(1) Olethreutid moths (Olethreutidae)

(a) Tip moths (including *Rhyacionia neomexicana, R. fumosana, R. zozana, and R. bushnelli*)

Damage was essentially to windbreak, nursery, and ornamental pines (ponderosa, Scots and Austrian) on the eastern lowlands. Reports of significant windbreak damage came from Weld, Washington, Yuma, and Phillips Counties.

(b) Pitch nodule moths *(Petrova metallica* and *P. arizonensis)*

These moths do little serious injury to pines. However, they were a constant source of landowners calls, especially concerning infested pinon in the Denver area. Populations of *P. metallica* were common on ponderosa pine in Larimer, Weld and Elbert Counties. Extensive areas of pinon infested by *P. arizonensis* were found six miles south of Gardner (Huerfano County) and six miles west of Antonito along S.R. 17 (Conejos County).

(c) Western pine shoot borer *(Eucosma sonomana)*

Moths of this species were caught on pheromone traps placed at various locations state-wide by Rocky Mountain Forest and Range Experiment Station personnel, but impacts are not known at this time.

(2) Phycitid moths (Phycitidae)

(a) Zimmerman pine moth *(Dioryctria zimmermani)*

Branch and upper stem breakage following Zimmerman pine moth attacks on windbreak pines.

Known to occur in all Nebraska counties bordering northeastern Colorado, this stem and branch borer was verified for only one Colorado county in 1977 (Phillips).

Numerous inquiries were received from nursery operations in the Boulder, Denver and Colorado Springs areas regarding importation (from Nebraska and other eastern states) of ZPM-infested stock. An intensive effort was made by CSFS and the Colorado Department of Agriculture to provide interested people with printed information on the insect and associated regulations.

(b) Other pine moths *(Dioryctria* spp. including *cambiicola)*

Members of this genus seriously damaged cone crops of ponderosa pine in widely-separated localities. These insects are also causing deformity and/or branch mortality to pinons southeast of Livermore in Owl Canyon (Larimer County), along S.R. 160 west of Walsenburg (Huerfano County) and along S.R. 17 west of Las Mesitas (Conejos County).

G. Stem Boring Moths

(1) Carpenterworm moths (Cossidae)

Carpenterworm *(Prionoxystus robiniae)*

One sample was taken from green ash within a windbreak south of Julesburg (Sedgwick County).

(2) Clearwing moths (Aegeriidae)

Lilac/ash borer *(Podosesia syringiae)*

Both subspecies *(syringiae* and *fraxini)* of this pest damaged ornamentals along the Front Range, especially in the Denver area.

WASPS AND BEES --

H. Conifer Sawflies (Diprionidae)

(1) Pine sawflies (*Neodiprion fulviceps, N. gillettei* and possibly others)

Sawfly activity generally decreased from 1976 levels. Two known outbreaks in ponderosa pine east of Colorado Springs apparently collapsed. The first, approximately 10 miles east of Kiowa (Elbert County), had seriously defoliated 10 acres during 1975 and 1976, but no sawfly activity was detected during two 1977 visits. The second outbreak, essentially confined to the Banning/Lewis Ranch one mile east of Colorado Springs' Peterson Field, was partially sprayed by landowners during 1976. Very little larval activity (or eggs) could be found during a June survey.

An outbreak of an unidentified sawfly in ponderosa pine was reported from Buena Vista (Chaffee County), but no additional information was received.

Light sawfly populations on ponderosa pine were detected at Carr (Weld County), Estes Park, and Horsetooth Ridge (both Larimer County) and south of Julesburg (Sedgwick County).

I. Miscellaneous Hymenoptera

(1) Horntails (*Tremex columba, Sirex* sp. and possibly others) were reported attacking declining ornamental maples (Larimer and Jefferson Counties) and fire-damaged pines near Stonewall (Las Animas County).

(2) *Dendrosotor protuberans*, a braconid wasp parasite of the lesser European elm bark beetle, was released by the Colorado Department of Agriculture (CDA) personnel at 21 municipalities. A total of 75,800 wasps were released in Fiscal Year 1977. The insect has been released in 27 counties since 1974 and has become established in some areas, but its overall impact on reducing Dutch elm disease (DED) is thought to be minor. It was also reported by CDA to parasitize the ash bark beetle, *Leperisinus californicus*, in the Grand Junction area.

(3) Ants harmed, and in some cases killed, new tree plantings on the Fort Morgan District.

TRUE BUGS AND HOMOPTERANS

J. Rhopalid Plant Bugs (Rhopalidae)

(1) Boxelder bug (*Leptocoris trivittatus*), while causing no serious injury to boxelders, did become a local nuisance by seeking shelter in houses and buildings state-wide.

K. Aphids (Aphididae)

(1) A species of *Cinara* (tentatively identified as *occidentalis*) was reported by Bureau of Land Management (BLM) personnel causing extensive branch kill and crown die-back to 8,000 acres of Douglas-fir on the Roan Plateau northwest of Rifle (Garfield County). Both BLM and USFS lands are involved. Tentative plans are to visit the site in 1978.

(2) At least two species of *Eriosoma* (woolly elm aphid, woolly apple aphid, etc.) caused cupping and distortion of ornamental hardwood leaves in several municipalities. Elms appeared to be the favored host.

L. Scales (Superfamily Coccoidea)

(1) Eriococcid scales (Eriococcidae)

European elm scale *(Gossyparia spuria)*

This scale was common on American elm in the eastern half of the state. Its impact in Fort Collins and Denver appeared to be up from 1976.

(2) Margarodid scales (Margarodidae)

Pinon needle scale *(Matsucoccus acalyptus)*

Reports of ornamental pinon damage were common from southern and western Colorado. An extensive area of infested native pinon was discovered on the Forbes Trinchera Ranch east of Fort Garland (Costilla County). Many trees displayed sparse crowns and some mortality is likely.

(3) Soft scales (Coccidae)

Cottony maple scale *(Pulvinaria innumerabilis)*

Reports of minor damage to silver maple and honeylocust came from Fort Collins, Greeley, and Berthoud (all Larimer County).

(4) Armored scales (Diaspididae)

Pine needle scale *(Phenacaspis pinifoliae)* and oystershell scale *(Lephidosaphes ulmi)*

Both were abundant on their respective hosts state-wide. Isolated cases of mortality were attributed to them, although loss of vigor and branch mortality were more common results.

M. Woolly Aphids, etc. (Phylloxeridae)

(1) Cooley spruce gall-aphid *(Adelges cooleyi)*

This gall-former was abundant on all spruce species, both ornamental and native, and, despite doing little harm, generated numerous landowner calls for information throughout the state. Populations on the alternate host, Douglas-fir, were not common.

N. Jumping Plant Lice (Psyllidae)

(1) Hackberry nipplegall maker *(Pachypsylla celtidismamma)*

This insect is abundant state-wide and in some cases renders hackberry less desirable as an ornamental.

CRICKETS, GRASSHOPPERS AND ALLIES

O. Short-Horned Grasshoppers (Acrididae)

Unidentified species caused considerable local defoliation damage to windbreaks and new plantings throughout the Fort Morgan District, in Weld County, and at the Chatfield and Pueblo Reservoir Revegetation Projects (Jefferson and Pueblo Counties, respectively). State-wide, grasshopper populations appeared to be increasing.

II. FOREST DISEASES

A. Needle Casts

There were no specific reports of needle cast diseases in 1977. The drought conditions prevalent over most of the state and increased incidence of forest defoliators on major conifer species presumably combined to keep incidence of needle diseases very low.

B. Rusts

The few reports received indicate that, while present, the perennial type rusts on conifers are not resulting in any serious impacts to Colorado forests. No reports of foliage rusts were received in 1977.

The special relationship of a *Peridermium* sp. (possibly *betheli*) with lodgepole pine dwarf mistletoe infestations is being investigated by Colorado State University's Department of Plant Pathology.

The following table lists the rusts reported in 1977. These are scattered throughout the ranges of the various hosts.

Rust	Scientific Name	Principal Hosts
Western gall rust	*Endocronartium harknessii*	Lodgepole and ponderosa pines
Comandra blister rust	*Cronartium comandrae*	Lodgepole pine
Limb rust	*Peridermium filamentosum*	Ponderosa pine
Fir witches'-broom	*Melampsorella caryophyllacearum*	True firs
Spruce witches'-broom	*Chrysomyxa arctostaphyli*	Engelmann spruce

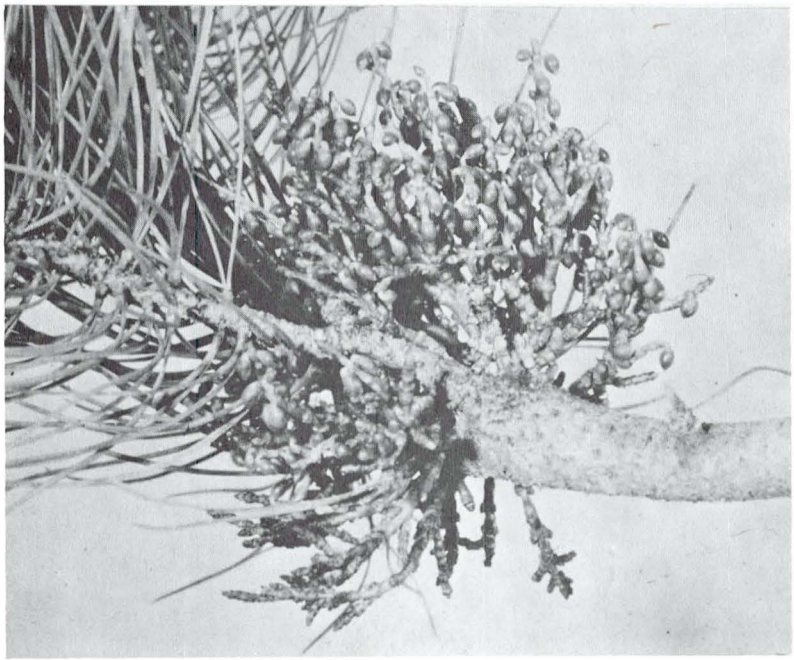
C. Leaf Spots and Blights

As with the needle casts, incidence of foliage diseases on hardwoods was very low in 1977. Undetermined species of *Alternaria* were isolated from blighted leaves of catalpa in Canon City, aspen in Grand Junction and Fort Collins, and cottonwoods in Walsenburg (Huerfano County), Grand Junction and in Morgan County at Wiggins and Fort Morgan. *Marsonnina* (sp. undetermined) was noted on cottonwoods at Woody Creek in Pitkin County and aspen in Fort Collins. A species of *Septoria* was identified on leaves of cottonwood in Eldorado Canyon (Boulder County) and inkspot of aspen *(Ciborinia* sp.*)* was noted on the Uncompahgre National Forest in western Colorado.

D.

Dwarf mistletoes, especially *Arceuthobium vaginatum* ssp. *cryptopodum* on ponderosa pine and *A. americanum* on lodgepole pine, are the most serious diseases to forests in Colorado. They very often cause a change in management objectives and/or management prescriptions.

Southwestern dwarf mistletoe on ponderosa pine -- semi-mature fruit.



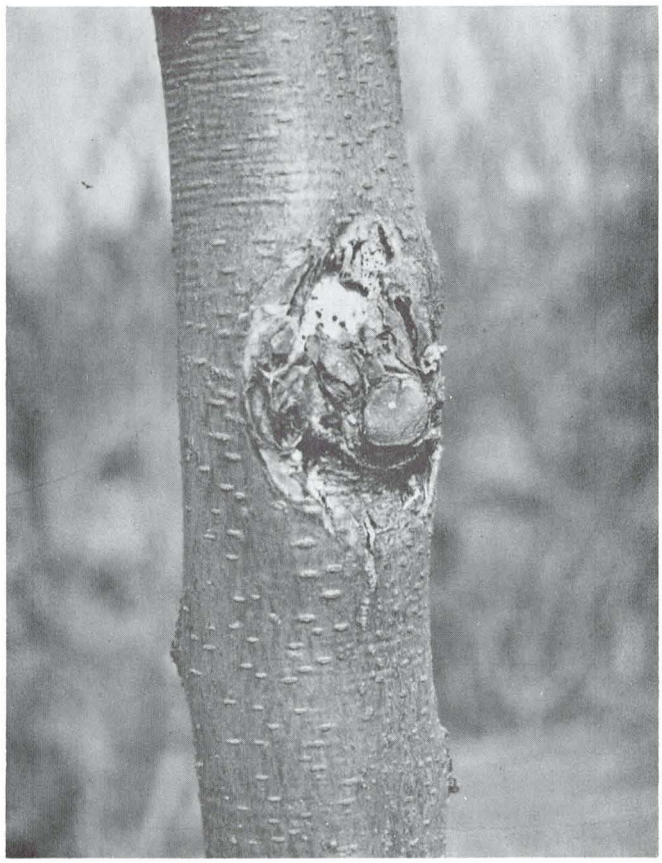
In the Front Range, dwarf mistletoe-infected ponderosa pine may occasionally act as focal points for new outbreaks of MPB.

The distributions by county of the five species of dwarf mistletoe and one true mistletoe are shown in Appendix III.

E. Cankers

(1) Thyronectria canker of honeylocust was first reported in Colorado by Hudler and Oshima in 1976 (Plant Disease Reporter 60:920-923). Since that time, many reports have been received. *Thyronectria austro-americana* has been isolated from diseased or dead trees from throughout the Metro Denver Area, especially Edgewater, Northglenn and Aurora. In Aurora, a severe outbreak destroyed about 20 trees in a two-block area. In Boulder County, this disease caused one nursery to rogue their entire honeylocust stock. New plantings were damaged in Boulder and on the University of Colorado campus. Other locations were Rocky Ford (Otero County), and Canon City (Fremont County). The cultivars "Morraine" and "Sunburst" seem to be the most susceptible.

Thyronectria canker on honeylocust.



(2) Gummosis of Russian olive

Three different fungi have been reported in the literature to be associated with cankers/gummosis of Russian olive. The symptoms are bark depressions, wood discoloration, brown to amber exudation of gum, wilting and subsequent death of branches and/or entire trees. Such symptoms are non-specific and can be related to infection by *Phytophthora cactorum*, *Phomopsis elaeagni* or *Botryodiplodia theobromae*. Russian olive ornamental and shelterbelt trees at scattered locations throughout eastern Colorado developed these symptoms this year. The causal agent, impact of the disease, and its relation to the current drought will be monitored in coming years.

(3) Cytospora cankers were also prevalent on various hosts in 1977. This increased incidence is also believed to be drought-related. *C. chrysosperma* was increasingly common on native cottonwoods in natural stands and ornamental plantings in all eastern districts. It was noted also on white poplar *(Populus alba)* varieties in the cities of Longmont and Alamosa.

One record of *C. annularis* was made on ash *(Fraxinus pennsylvania)* in Alamosa.

F. Root Diseases

(1) *Armillariella mellea* was recorded from several small patches of dead pinon pine along the Arkansas River from Howard to Poncha Springs and Salida in Fremont and Chaffee Counties, and evidently killed 250 pinons on three acres near Farisita (Huerfano County). This fungus was also noted on pinon west of the Great Divide in Colorado. It was also recorded causing considerable mortality in a 60-acre stand of Engelmann spruce near Divide (Teller County).

(2) Black stain root disease of pinon pine, caused by *Verticicladiella wagenerii*, is common throughout the range of pinon west of the Great Divide as previously reported (Plant Disease Reporter 60: 713-717). Mortality occurs in patches and is of concern only in or adjacent to housing developments.

G. Bacterial Diseases

(1) Fireblight was especially common and serious on flowering ornamental trees in the Denver metropolitan area, on ornamental crab apples in Fort Collins and Alamosa, and on pear and apple trees in the Arkansas River Valley in and near Canon City.

(2) Slime flux (wetwood) reports declined in comparison to other years, perhaps attributable to the general drought condition.

(3) Bacterial gall of Douglas-fir is common but at very low levels in most of the mountainous areas of the state.

H. Environmental Problems

Symptoms of drought stress were evident throughout most of Colorado. Urban trees in locations in which watering restrictions were imposed have naturally showed the most symptoms. The most serious reports were from Rocky Ford (Otero County) where basswood, redbud, elms, and sycamores exhibited marginal browning and wilting of leaves and branch die-back; Weld County, where many species of urban trees showed various symptoms; and most of the western plains counties adjacent to the Front Range where symptoms ranged from typical winter-drying to summer scorch and wilting. Other notable reports came from the Steamboat Springs and Evergreen areas where common juniper was damaged because of a general lack of winter snow cover. Winter drying of conifers was also common in the Durango area.

An ice storm in March caused widespread damage to shelterbelt and urban trees in the northeast corner of the state. A tornado caused damage on about 500 acres in the Rampart Range in El Paso County.

I. Dutch Elm Disease

Colorado appears to be "holding the line" against this disease. The number of excellent sanitation programs is increasing steadily (43 this year). Losses have decreased in areas where such sanitation programs were carried out for more than two years. The value and future of chemical prevention-protection and pheromone-trapping are still uncertain.

There were 2,125 confirmed cases of Dutch elm disease in Colorado in 1977. Another 739 elms were reportedly removed without benefit of culture. Seventy-two percent of confirmed cases were removed and/or properly treated, leaving 565 diseased elms to cause at least 1,700 new cases next year. The graph on page 45 illustrates confirmed losses sustained since 1968.

Forty-one municipalities and two counties are removing all diseased elm wood before new broods of the Lesser European elm bark beetle can be produced. Forty-five other areas are working somewhat less efficiently. However, 32 critical areas continue to do nothing to help control this disease. (A list of critical areas is appended.)

Aside from the Metro Denver Area, El Paso County (Colorado Springs) continued to be the "hot spot" with losses increasing from 46 confirmed cases in 1976 to 263 cases this year. However, intense sanitation in the area, coupled with chemical applications, were employed in an effort to minimize losses next year.

In Boulder County, Siberian elms became the object of attention. Of the 24 elms lost in Longmont, eight were Siberian, indicating that more attention should be given this "resistant" species as a disease reservoir. Dr. Wayne Nishijima, Colorado State University, is conducting studies to determine if the Boulder County fungus is a different strain than that found elsewhere in the state.

Five new locations were added this year. They are: Sugar City and Olney Springs (both in Crowley County), Fowler (Otero County), Portland (Fremont County), and Palmer Lake (El Paso County). The updated distribution is shown on page 44.

CSFS crews surveyed and sampled 125 critical areas containing 356,922 elms. Eleven of these areas were surveyed twice. Four major municipalities that conducted their own surveys are: Denver, Fort Collins, Aurora and Pueblo. CSFS laboratory processed 2,562 samples.

Special Studies (DED)

(1) Chemical prophylactic treatments

Seventy-seven elms on the Colorado State University campus were injected with the preventative chemical MBC-P (Correx (R)) using low pressure injection techniques. Bioassays were made at various intervals starting 10 days after injection to determine the distribution and fungistatic activity within the tree. Most trees sampled showed good to excellent inhibition of the fungus on some branches, but far too much variation was found depending on which branch was sampled.

Colorado Springs City Forestry Division also treated elms using the same technique. Bioassays from these trees indicated very little fungistatic activity. Another series of assays are being made, and notes are being compared to determine differences between the Fort Collins and Colorado Springs results.

(2) Chemotherapy

Twenty-one Larimer County elms with confirmed Dutch elm disease (DED) were treated with either Correx (R) or Arbotect (R) by Dr. Nishijima or CSFS. Symptomatic branches were pruned after treatment. One elm has been removed; the rest are being carefully watched for recurrence of the disease.

(3) Pheromone-Trapping

See section on Lesser European elm bark beetle.

(4) Summary

The following table summarizes, by CSFS District and counties, DED control accomplishments.

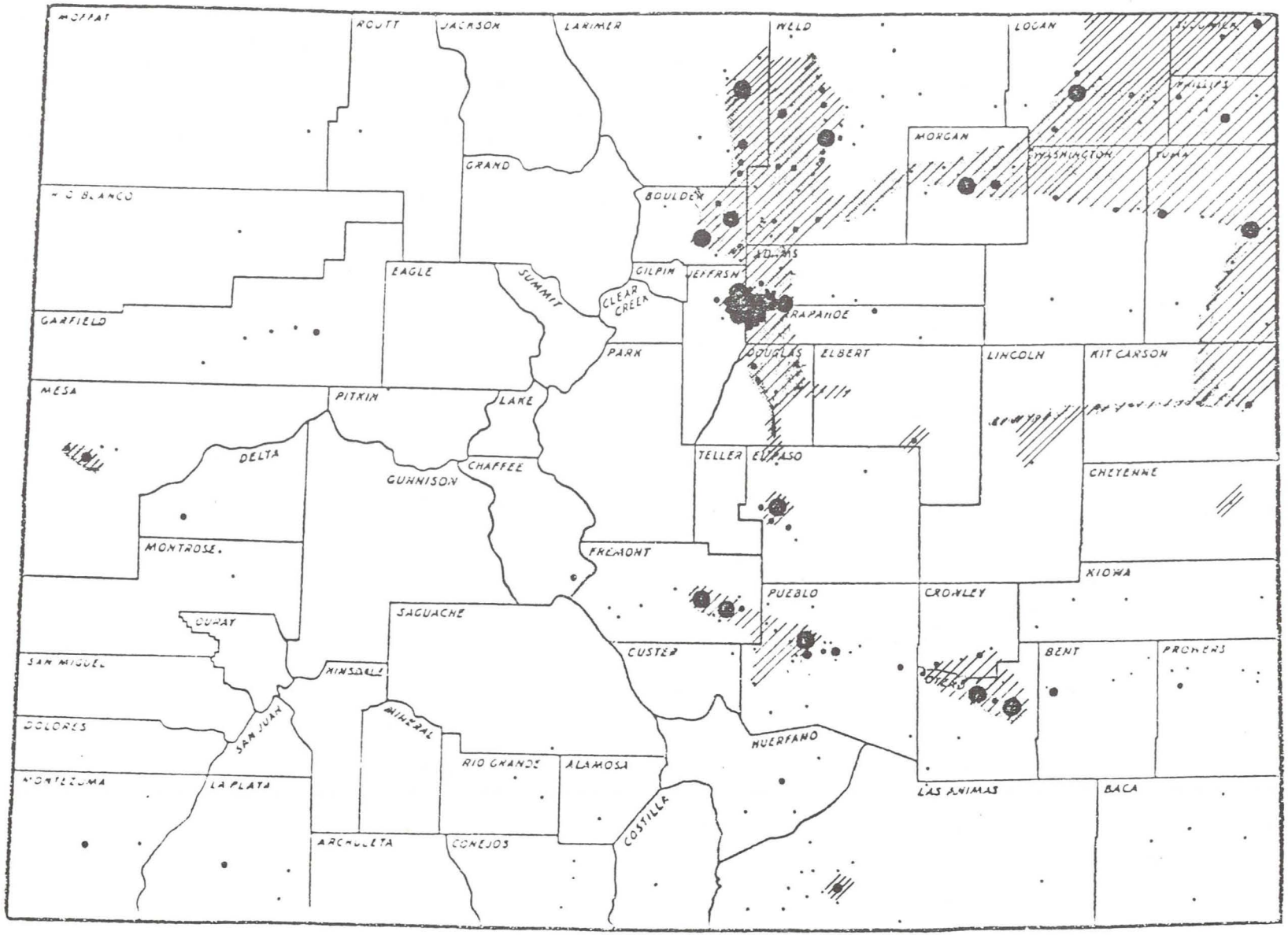
Counties by CSFS District *	1977 Status Report # Critical Areas	Effective Control Program	Active Control Program	Elm Population In Critical Areas	Confirmed DED Cases	Removed or Treated	Percent Removed/ Cases	Other Removals
Boulder Co./ Dist. Total	7	Ø	7	15,717	144	97	67.0%	-
Chaffee	1	1		10,202	Ø	-	-	NR
Fremont	5	2		52,044	13	NR	-	NR
Pueblo	5	_	1	157,327	298	NR	-	NR
Canon City Dist. Total	11	3	1	219,573	311	NR	-	NR
Elbert	2	1		3,659	5	4	80.0	-
El Paso	6	6		96,910	275	275	100.0	119
Kit Carson	4	2		15,699	8	6	75.0	-
Lincoln	2	Ø	Ø	11,695	1	Ø	-	-
Woodland Park Dist. Total	14	9		127,963	289	285	98.6	119
Adams	9	6	3	39,441	39	39	100.0	
Arapahoe	4	Ø	4	27,735	1	NR	-	
Denver	1	1		158,263	522	522	100.0	580
Douglas	3	Ø	3	691	4	NR	-	
Denver Dist. Total	17	7	10	226,130	566	561	99.0	580
La Plata	1	1		2,665	Ø	-	-	-
Montezuma	1	-	-	8,209	Ø	-	-	-
Durango Dist. Total	2	1		11,074	Ø	-	-	-
Larimer	5	4	1	34,220	217	217	100.0	29
Weld	16	8	8	23,995	226	197	86.7	5
Fort Collins Dist. Total	21	12	9	58,215	443	414	93.4	34

1977 Status Report, Continued

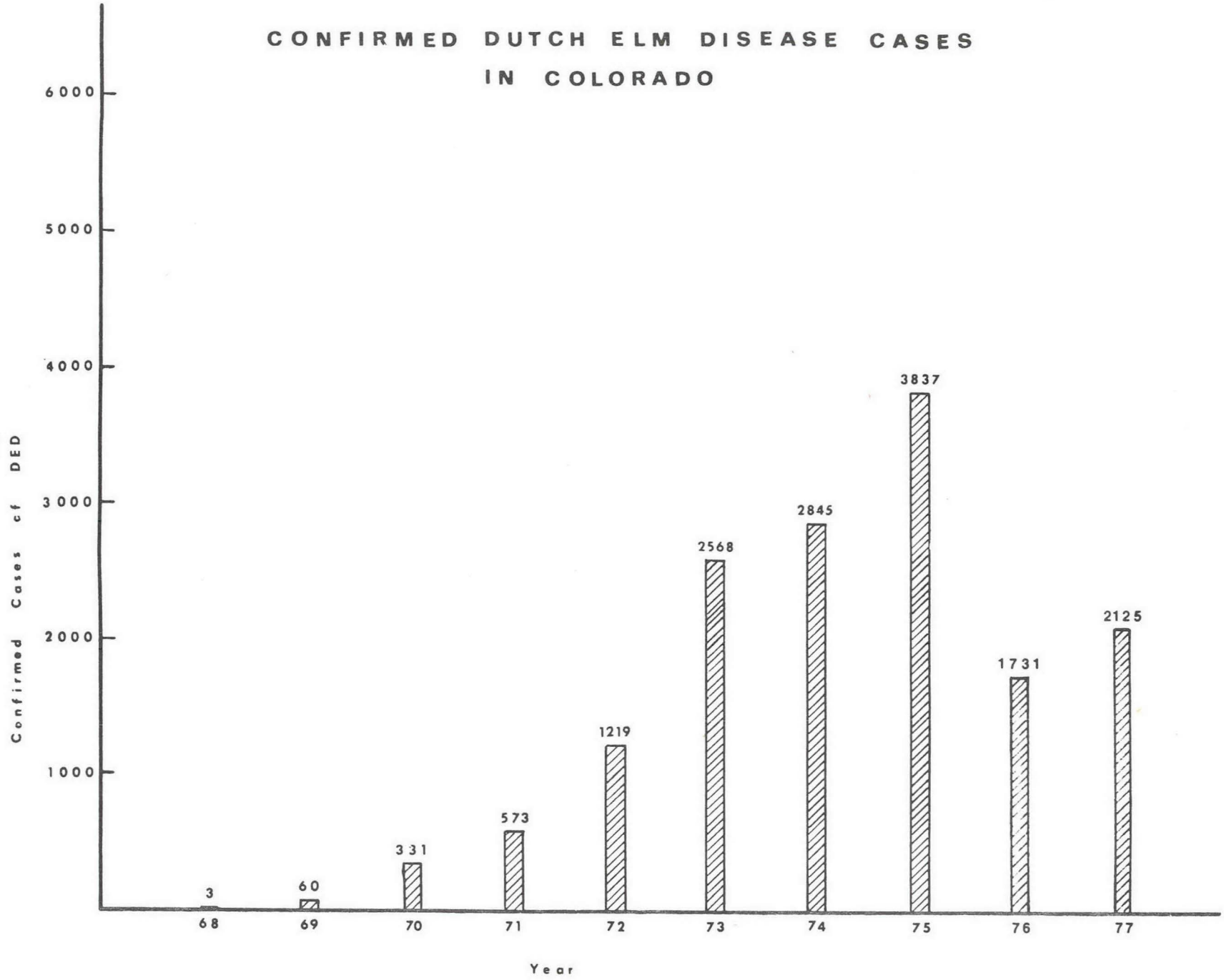
Counties by CSFS District *	# Critical Areas	Effective Control Program	Active Control Program	Elm Population In Critical Areas	Confirmed DED Cases	Removed or Treated	Percent Removed/ Cases	Other Removals
Logan	5	Ø		18,471	21	2	9.0%	
Morgan	4	1	3	13,724	78	39	50.0	
Phillips	4	2		12,040	10	10	100.0	
Sedgwick	3	Ø		8,176	6	Ø	Ø	
Washington	2	1		8,943	2	1	50.0	
Yuma	4	3	1	14,130	9	8	89.0	
Fort Morgan Dist. Total	22	7	4	75,484	126	60	48.0	
Jefferson Co/ Golden Dist. Total	7	2	5	98,465	142	89	63.0	6
Delta	1			3,184	Ø	-	-	-
Garfield	1			3,274	Ø	-	-	-
Mesa	3		1	19,977	2	Ø	Ø	-
Rio Blanco	1		-	2,146	Ø	-	-	-
Grand Junction Dist. Total	6		1	28,581	2	Ø	Ø	-
Bent	1	-	-	11,375	Ø	-	-	-
Crowley	3	1	2	6,416	4	4	100.0	
Cheyenne	1	1	-	4,307	Ø	-	-	-
Las Animas	1	-	1	5,230	Ø	-	-	-
Otero	5	-	5	28,121	98	24	24.5	
Prowers	2	-	-	25,990	Ø	-	-	-
LARK Dist. Total	13	2	8	81,439	102	28	27.4	
Steamboat Spgs. Dist. Total	Ø	-	-	-	-	-	-	-
STATE-WIDE	120	43	45	942,641 **	2,125	1,534	72.2	739

* Only counties with critical areas are listed.
** There are 1 million elms outside the critical areas.

COLORADO



Dots indicate municipalities surveyed for Dutch elm disease (DED)
Shaded areas are those from which positive cases of DED have been recorded


CONFIRMED DUTCH ELM DISEASE CASES
IN COLORADO
Confirmed Cases of DED
6000
5000
4000
3000
2000
1000
3
60
331
573
1219
2568
2845
3837
1731
2125
68
69
70
71
72
73
74
75
76
77
Year

Critical Area List

District	County	Area
Alamosa		-
Canon City	Chaffee	Salida
	Fremont	Beaver Park
		Canon City
		Florence
		Portland
		West Park
	Pueblo	Blende
		Nepesta
		Pueblo
		Vineland
		Salt Creek
Woodland Park	Elbert	Kiowa
		Simla
	El Paso	Rival
		Colorado Springs
		Fountain
		Manitou Springs
		Palmer Lake
		Rural El Paso County
		Security
	Kit Carson	Burlington
		Flagler
		Seibert
		Stratton
	Lincoln	Hugo
		Limon
Denver	Adams	Aurora
		Bennett
		Brighton
		Commerce City
		East Lake
		Northglenn
		Strasburg
		Thornton
		Westminster
	Arapahoe	Byers
		Cherry Hills
		Englewood
		Littleton
	Denver	Denver
	Douglas	Castle Rock
		Louviers
		Parker
Durango	La Plata	Durango
	Montezuma	Cortez

District	County	Area
Fort Collins	Larimer	Berthoud
		Fort Collins
		Loveland
		Rural Larimer County
		Wellington
	Weld	Ault
		Dacono
		Eaton
		Evans
		Frederick
		Greeley
		Johnstown
		Keenesburg
		Kersey
		La Salle
		Mead
		Nunn
		Platteville
		Rural Weld County
		Severance
		Windsor
Fort Morgan	Logan	Fleming
		Merino
		Padroni
		Peetz
		Sterling
	Morgan	Brush
		Fort Morgan
		Hillrose
		Orchard
	Phillips	Amherst
		Haxtun
		Holyoke
		Paoli
	Sedgwick	Julesburg
		Ovid
		Sedgwick
	Washington	Akron
		Otis
	Yuma	Eckley
		Laird
		Wray
		Yuma
Golden	Jefferson	Applewood
		Arvada
		Edgewater
		Golden
		Lakewood
		Rural Jefferson County
		Wheatridge

District	County	Area
Grand Junction	Delta	Delta
	Garfield	Glenwood Springs
	Mesa	Fruita
		Grand Junction
		Orchard Mesa
	Rio Blanco	Rangely
LARK	Bent	Las Animas
	Cheyenne	Cheyenne Wells
	Crowley	Olney Springs
		Ordway
		Sugar City
	Las Animas	Trinidad
	Otero	Fowler
		La Junta
		Monzanola
		Rocky Ford
		Swink
	Prowers	Holly
		Lamar
Boulder	Boulder	Boulder
		Broomfield
		Lafayette
		Longmont
		Louisville
		Lyons
		Rural Boulder County
Steamboat Springs		-----

A P P E N D I X I

1977 -- Pest Occurrence By County

The following pests were so widely distributed throughout their respective host ranges in 1977 that specific location references are limited to special cases or omitted completely.

Insects	Diseases
boxelder bug	bacterial gall of Douglas-fir
Cooley spruce gall aphid	cytospora canker
cottonwood blotch miner	fireblight
cottonwood leaf beetle	slime flux
elm leaf beetle	
engraver *(Ips)* beetles	
European elm scale	
fall webworm	
forest tent caterpillar	
fruit-tree leaf roller	
oystershell scale	
pine flatheaded borers	
pine roundheaded borers	
red turpentine beetle	
spiny elm caterpillar	
tip moths	
twig beetles	
woolly elm aphid	

ADAMS COUNTY

elm leaf beetle	Dutch elm disease
lesser European elm bark beetle	thyronectria canker

ALAMOSA COUNTY

lesser European elm bark beetle	cytospora canker
western spruce budworm	Douglas-fir dwarf mistletoe
	fireblight

ARAPAHOE COUNTY

lesser European elm bark beetle	Dutch elm disease
	thyronectria canker

ARCHULETA COUNTY

forest tent caterpillar	Douglas-fir dwarf mistletoe
mountain pine beetle	juniper true mistletoe
roundheaded pine beetle	southwestern dwarf mistletoe
Sonoran tent caterpillar	
western tent caterpillar	

Insects	Diseases
BACA COUNTY	
lesser European elm bark beetle	
BOULDER COUNTY	
a flatheaded wood borer (honeylocust)	cottonwood leaf spot
a spruce tussock moth	cytospora canker
Douglas-fir beetle	Dutch elm disease
Douglas-fir tussock moth	limber pine dwarf mistletoe
Ips spp.	lodgepole pine dwarf mistletoe
lesser European elm bark beetle	southwestern dwarf mistletoe
mountain pine beetle	thyronectria canker
pine budworm	
pine tiger moth	
pine webworm or near relative	
ponderosa needle miner	
poplar borer	
twig beetle	
western spruce budworm	
CHAFFEE COUNTY	
a pine sawfly	Douglas-fir dwarf mistletoe
fall webworm	lodgepole pine dwarf mistletoe
Ips spp.	shoestring root rot
mountain pine beetle	southwestern dwarf mistletoe
twig beetle	
CHEYENNE COUNTY	
lesser European elm bark beetle	Dutch elm disease
CLEAR CREEK COUNTY	
a spruce tussock moth	limber pine dwarf mistletoe
Douglas-fir tussock moth	lodgepole pine dwarf mistletoe
mountain pine beetle	southwestern dwarf mistletoe
western spruce budworm	
CONEJOS COUNTY	
mountain pine beetle	Douglas-fir dwarf mistletoe
pitch nodule moths	southwestern dwarf mistletoe
western tent caterpillar	
COSTILLA COUNTY	
pinon needle scale	southwestern dwarf mistletoe
white fir needle miner	
western spruce budworm	

Insects	Diseases
CROWLEY COUNTY	
lesser European elm bark beetle	Dutch elm disease
CUSTER COUNTY	
mountain pine beetle western spruce budworm	Douglas-fir dwarf mistletoe southwestern dwarf mistletoe
DELTA COUNTY	
Douglas-fir beetle fall webworm pine tiger moth	juniper true mistletoe pinon pine dwarf mistletoe
DENVER COUNTY	
a flatheaded wood borer (honeylocust) Douglas-fir tussock moth European elm scale forest tent caterpillar lesser European elm bark beetle lilac/ash borer pitch nodule moths	Dutch elm disease fireblight southwestern dwarf mistletoe thyronectria canker
DOLORES COUNTY	
	Douglas-fir dwarf mistletoe juniper true mistletoe pinon pine dwarf mistletoe southwestern dwarf mistletoe
DOUGLAS COUNTY	
a spruce tussock moth Douglas-fir tussock moth lesser European elm bark beetle mountain pine beetle pine budworm ponderosa needle miner ugly-nest caterpillar western spruce budworm white fir needle miner	Douglas-fir dwarf mistletoe Dutch elm disease lodgepole pine dwarf mistletoe southwestern dwarf mistletoe
EAGLE COUNTY	
	Douglas-fir dwarf mistletoe lodgepole pine dwarf mistletoe

Insects	Diseases
ELBERT COUNTY	
a pine sawfly	Dutch elm disease
Ips spp.	southwestern dwarf mistletoe
lesser European elm bark beetle	
mountain pine beetle	
pine butterfly	
pine tiger moth	
pitch nodule moths	
ponderosa needle miner	
twig beetle	
EL PASO COUNTY	
a pine sawfly	Douglas-fir dwarf mistletoe
Douglas-fir tussock moth	Dutch elm disease
lesser European elm bark beetle	limber pine dwarf mistletoe
mountain pine beetle	mountain tornado
pandora moth or near relative	southwestern dwarf mistletoe
pine budworm	
pine butterfly	
ponderosa needle miner	
western spruce budworm	
FREMONT COUNTY	
a juniper leaf miner	catalpa leaf spot
lesser European elm bark beetle	Douglas-fir dwarf mistletoe
mountain pine beetle	Dutch elm disease
pine tiger moth	fireblight
western spruce budworm	limber pine dwarf mistletoe
	shoestring root rot
	southwestern dwarf mistletoe
	thyronectria canker
GARFIELD COUNTY	
Douglas-fir beetle	Douglas-fir dwarf mistletoe
flocculent fir aphid	juniper true mistletoe
	pinon pine dwarf mistletoe
GILPIN COUNTY	
a spruce tussock moth	limber pine dwarf mistletoe
Douglas-fir tussock moth	lodgepole pine dwarf mistletoe
mountain pine beetle	southwestern dwarf mistletoe
western spruce budworm	
GRAND COUNTY	
mountain pine beetle	lodgepole pine dwarf mistletoe

Insects	Diseases
GUNNISON COUNTY	
western spruce budworm	Douglas-fir dwarf mistletoe lodgepole pine dwarf mistletoe
HINSDALE COUNTY	
	Douglas-fir dwarf mistletoe southwestern dwarf mistletoe
HUERFANO COUNTY	
fall webworm fir engraver mountain pine beetle pitch nodule moths spruce beetle western spruce budworm western tent caterpillar white fir needle miner	cottonwood leaf spot Douglas-fir dwarf mistletoe limber pine dwarf mistletoe shoestring root rot southwestern dwarf mistletoe
JACKSON COUNTY	
mountain pine beetle spruce beetle	limber pine dwarf mistletoe lodgepole pine dwarf mistletoe
JEFFERSON COUNTY	
a spruce tussock moth Douglas-fir tussock moth elm leaf beetle *Ips* spp. lesser European elm bark beetle lodgepole terminal weevil mountain pine beetle pigeon tremex pine budworm ponderosa needle miner poplar borer western spruce budworm	Douglas-fir dwarf mistletoe (?) drought stress Dutch elm disease lodgepole pine dwarf mistletoe southwestern dwarf mistletoe
KIOWA COUNTY	
elm leaf beetle	
KIT CARSON COUNTY	
lesser European elm bark beetle	Dutch elm disease
LAKE COUNTY	
	lodgepole pine dwarf mistletoe

Insects	Diseases
LA PLATA COUNTY	
lesser European elm bark beetle	Douglas-fir dwarf mistletoe
mountain pine beetle	drought stress
pinon needle miner	juniper true mistletoe
ponderosa needle miner	pinon pine dwarf mistletoe
red turpentine beetle	southwestern dwarf mistletoe
Sonoran tent caterpillar	
twig beetle	
western spruce budworm	
LARIMER COUNTY	
American dagger moth	aspen leaf spot
a pine moth	Dutch elm disease
a pine sawfly	fireblight
a ponderosa pine cone weevil	limber pine dwarf mistletoe
ash bark beetle	lodgepole pine dwarf mistletoe
a spruce tussock moth	southwestern dwarf mistletoe
cottony maple scale	thyronectria canker
Douglas-fir beetle	
European elm scale	
forest tent caterpillar	
Hylurgops spp.	
Ips spp.	
lesser European elm bark beetle	
lodgepole terminal weevil	
mountain pine beetle	
pandora moth or near relative	
pigeon tremex	
pine budworm	
pine butterfly	
pine tiger moth	
pine webworm or near relative	
pitch nodule moths	
ponderosa needle miner	
strawberry root weevil	
twig beetle	
ugly-nest caterpillar	
western pine shoot borer	
western spruce budworm	
white pine weevil	
LAS ANIMAS COUNTY	
a pine horntail	Douglas-fir dwarf mistletoe
a tachinid fly	Dutch elm disease
Douglas-fir beetle	southwestern dwarf mistletoe
fall webworm	
fir engraver	

Insects	Diseases
LAS ANIMAS COUNTY, continued:	
Ips spp.	
lesser European elm bark beetle	
mountain pine beetle	
red turpentine beetle	
roundheaded pine beetle	
spruce beetle	
western spruce budworm	
western tent caterpillar	
white fir needle miner	
LINCOLN COUNTY	
lesser European elm bark beetle	Dutch elm disease
LOGAN COUNTY	
fall webworm	Dutch elm disease
lesser European elm bark beetle	
poplar leaf rollers (miscellaneous)	
western spruce budworm	
MESA COUNTY	
a juniper flatheaded borer	aspen leaf spot
ash bark beetle	cottonwood leaf spot
Douglas-fir beetle	Douglas-fir dwarf mistletoe
Ips spp.	Dutch elm disease
lesser European elm bark beetle	juniper true mistletoe
	pinon pine dwarf mistletoe
	southwestern dwarf mistletoe
MINERAL COUNTY	
	Douglas-fir dwarf mistletoe
	southwestern dwarf mistletoe
MOFFAT COUNTY	
	lodgepole pine dwarf mistletoe
MONTEZUMA COUNTY	
elm leaf beetle	Douglas-fir dwarf mistletoe
lesser European elm leaf beetle	juniper true mistletoe
mountain pine beetle	pinon pine dwarf mistletoe
red turpentine beetle	southwestern dwarf mistletoe
roundheaded pine beetle	

Insects	Diseases
MONTROSE COUNTY	
lesser European elm bark beetle	aspen ink spot
western tent caterpillar	Douglas-fir dwarf mistletoe
	juniper true mistletoe
	pinon pine dwarf mistletoe
	southwestern dwarf mistletoe
MORGAN COUNTY	
ants	cottonwood leaf spot
lesser European elm bark beetle	Dutch elm disease
OTERO COUNTY	
elm leaf beetle	drought stress
fall webworm	Dutch elm disease
lesser European elm bark beetle	thyronectria canker
OURAY COUNTY	
fir engraver	Douglas-fir dwarf mistletoe
mountain pine beetle	pinon dwarf mistletoe
	southwestern dwarf mistletoe
PARK COUNTY	
mountain pine beetle	Douglas-fir dwarf mistletoe
pine budworm	lodgepole pine dwarf mistletoe
ponderosa needle miner	southwestern dwarf mistletoe
western spruce budworm	
western tent caterpillar	
PHILLIPS COUNTY	
elm leaf beetle	Dutch elm disease
lesser European elm bark beetle	
pine tip moths	
Zimmerman pine moth	
PITKIN COUNTY	
white pine weevil	cottonwood leaf spot
	Douglas-fir dwarf mistletoe
	lodgepole pine dwarf mistletoe
PUEBLO COUNTY	
lesser European elm bark beetle	Douglas-fir dwarf mistletoe
mountain pine beetle	Dutch elm disease
	southwestern dwarf mistletoe

Insects	Diseases
RIO BLANCO COUNTY	
	lodgepole pine dwarf mistletoe pinon pine dwarf mistletoe
RIO GRANDE COUNTY	
mountain pine beetle	Douglas-fir dwarf mistletoe southwestern dwarf mistletoe
ROUTT COUNTY	
poplar borer ugly-nest caterpillar	drought stress lodgepole pine dwarf mistletoe
SAGUACHE COUNTY	
western spruce budworm	Douglas-fir dwarf mistletoe lodgepole pine dwarf mistletoe southwestern dwarf mistletoe
SAN JUAN COUNTY	
	Douglas-fir dwarf mistletoe
SAN MIGUEL COUNTY	
fir engraver	Douglas-fir dwarf mistletoe juniper true mistletoe pinon pine dwarf mistletoe southwestern dwarf mistletoe
SEDGWICK COUNTY	
a pine sawfly carpenter worm eastern tent caterpillar elm leaf beetle fall webworm lesser European elm bark beetle poplar leaf rollers (miscellaneous)	Dutch elm disease
SUMMIT COUNTY	
mountain pine beetle	lodgepole pine dwarf mistletoe

Insects	Diseases
TELLER COUNTY	
mountain pine beetle	Douglas-fir dwarf mistletoe
pine budworm	shoestring root rot
western spruce budworm	southwestern dwarf mistletoe
western tent caterpillar	
WASHINGTON COUNTY	
lesser European elm bark beetle	Dutch elm disease
pine tip moths	
WELD COUNTY	
a pine sawfly	drought stress
cottonwood blotch miners	Dutch elm disease
cottony maple scale	
elm leaf beetle	
lesser European elm bark beetle	
mountain pine beetle	
pine sawfly	
pine tip moths	
pitch nodule moths	
ponderosa needle miner	
YUMA COUNTY	
elm leaf beetle	Dutch elm disease
fall webworm	
lesser European elm bark beetle	
pine tip moths	

A P P E N D I X I I

1977 -- Pest Occurrence by Host

alder	*(Alnus* spp.*)*
	alder flea beetle
	leaf beetle
	Phyllonorycter sp.
	spittlebug
apple	*(Malus* spp.*)*
	cigar casebearer
	fruit-tree leaf roller
	shothole borer
	fireblight
ash, green	*(Fraxinus pennsylvanica* Marsh *)*
	ash bark beetle
	ash borer
	carpenterworm
	oystershell scale
	tiger swallowtail
	cytospora canker
aspen, quaking	*(Populus tremuloides* Michx.*)*
	a tachinid fly
	forest tent caterpillar
	oystershell scale

aspen, quaking, continued:	poplar borer
	poplar leaf miners (miscellaneous)
	ugly-nest caterpillar
	western tent caterpillar
	aspen ink spot
	aspen leaf spot
basswood (American linden)	*(Tilia americana* L.*)*
	drought stress
boxelder	*(Acer negundo* L.*)*
	boxelder bug
catalpa	*(Catalpa* spp.*)*
	catalpa leaf spot
cherry	*(Prunus* spp.*)*
	fireblight
cherry, choke	*(Prunus virginiana* L.*)*
	ugly-nest caterpillar
	western tent caterpillar
cottonwood	*(Populus* spp.*)*
	cottonwood blotch miner
	cottonwood leaf beetle

cottonwood, continued:	fall webworm
	oystershell scale
	poplar leaf rollers (miscellaneous)
	western tent caterpillar
	cottonwood leaf spot
	cytospora canker
	slime flux (wetwood)
Douglas-fir	*(Pseudotsuga menziesii* var. *glauca* (Mirb.) Franco*)*
	Douglas-fir beetle
	Douglas-fir tussock moth
	flocculent fir aphid
	strawberry root weevil
	western spruce budworm
	bacterial gall
	Douglas-fir dwarf mistletoe
elm	*(Ulmus* spp.*)*
	elm leaf beetle
	European elm scale
	lesser European elm bark beetle
	oystershell scale
	spiny elm caterpillar
	woolly elm aphid
	drought stress
	Dutch elm disease
	slime flux (wetwood)

fir, corkbark *(Abies lasiocarpa* var. *arizonica* (Merriam) Lemm.*)*

western spruce budworm

fir, subalpine *(Abies lasiocarpa* (Hook) Nutt.*)*

western spruce budworm

fir witches'-broom

fir, white *(Abies concolor* (Gord. & Glend.) Hoopes*)*

fir engraver

western spruce budworm

white fir needle miner

fir witches'-broom

hackberry *(Celtis occidentalis* L.*)*

hackberry nipplegall maker

honeylocust *(Gleditsia triacanthos* L.*)*

a flatheaded wood borer

cottony maple scale

thyronectria canker

juniper *(Juniperus* spp.*)*

a flatheaded wood borer

a juniper leaf miner

drought stress

juniper true mistletoe

lilac, common	*(Syringa vulgaris* L.*)*
	lilac borer
	lilac leaf miner
mountain-mahogany	*(Cercocarpus* spp.*)*
	western tent caterpillar
oak, gambel	*(Quercus gambelii* Nutt.*)*
	forest tent caterpillar
	Sonoran tent caterpillar
pear	*(Pyrus* spp.*)*
	fireblight
pine, Austrian	*(Pinus nigra* Arnold*)*
	pine needle scale
	pine tip moths
	Zimmerman pine moth
pine, bristlecone	*(Pinus aristata* Engelm.*)*
	limber pine dwarf mistletoe
pine, limber	*(Pinus flexilis* James*)*
	limber pine dwarf mistletoe
	lodgepole pine dwarf mistletoe
	southwestern dwarf mistletoe

pine, lodgepole	*(Pinus contorta* Dougl.*)*
	Ips spp.
	lodgepole pine terminal weevil
	mountain pine beetle
	pine tiger moth
	western pine shoot borer
	comandra blister rust
	dwarf mistletoe rust
	limber pine dwarf mistletoe
	lodgepole pine dwarf mistletoe
	southwestern dwarf mistletoe
	western gall rust
pine, ponderosa	*(Pinus ponderosa* var. *scopulorum* Engelm.*)*
	a cone weevil
	a pine horntail
	a pine moth
	a pine sawfly
	flatheaded wood borer
	Hylurgops spp.
	Ips spp.
	mountain pine beetle
	pandora moth (or near relative)
	pine budworm
	pine butterfly
	pine needle scale
	pine tiger moth
	pine tip moths

pine, ponderosa, continued:	pine webworm (or near relative)
	pitch nodule moths
	ponderosa needle miner
	red turpentine beetle
	roundheaded pine beetle
	twig beetle
	western pine beetle
	limber pine dwarf mistletoe
	limb rust
	lodgepole pine dwarf mistletoe
	southwestern dwarf mistletoe
	western gall rust
pine, Scots	*(Pinus sylvestris* L.*)*
	pine needle scale
	pine tip moths
pinon (=pinyon)	*(Pinus edulis* Engelm.*)*
	a pine moth
	pine tiger moth
	pinon needle miner
	pinon needle scale
	pitch nodule moths
	twig beetle
	black stain root disease
	pinon pine dwarf mistletoe
	shoestring root rot

plum	*(Prunus* spp.*)*
	pear sawfly
redbud	*(Cercis* spp.*)*
	drought stress
Russian olive	*(Elaeagnus angustifolia* L.*)*
	gummosis
maple, silver	*(Acer saccharinum* L.*)*
	American dagger moth
	cottony maple scale
	oystershell scale
	pigeon tremex (horntail)
spruce, blue	*(Picea pungens* Engelm.*)*
	Douglas-fir tussock moth
	pine needle scale
	western spruce budworm
	white pine weevil
spruce, Engelmann	*(Picea engelmanni* Parry*)*
	a spruce tussock moth
	Douglas-fir tussock moth
	spruce beetle
	western spruce budworm
	white pine weevil

spruce, Engelmann, continued:	shoestring root rot
	spruce witches'-broom
sycamore	*(Plantanus occidentalis* L.*)*
	drought stress
willow	*(Salix* spp.*)*
	cottonwood leaf beetle
	eastern tent caterpillar
	oystershell scale

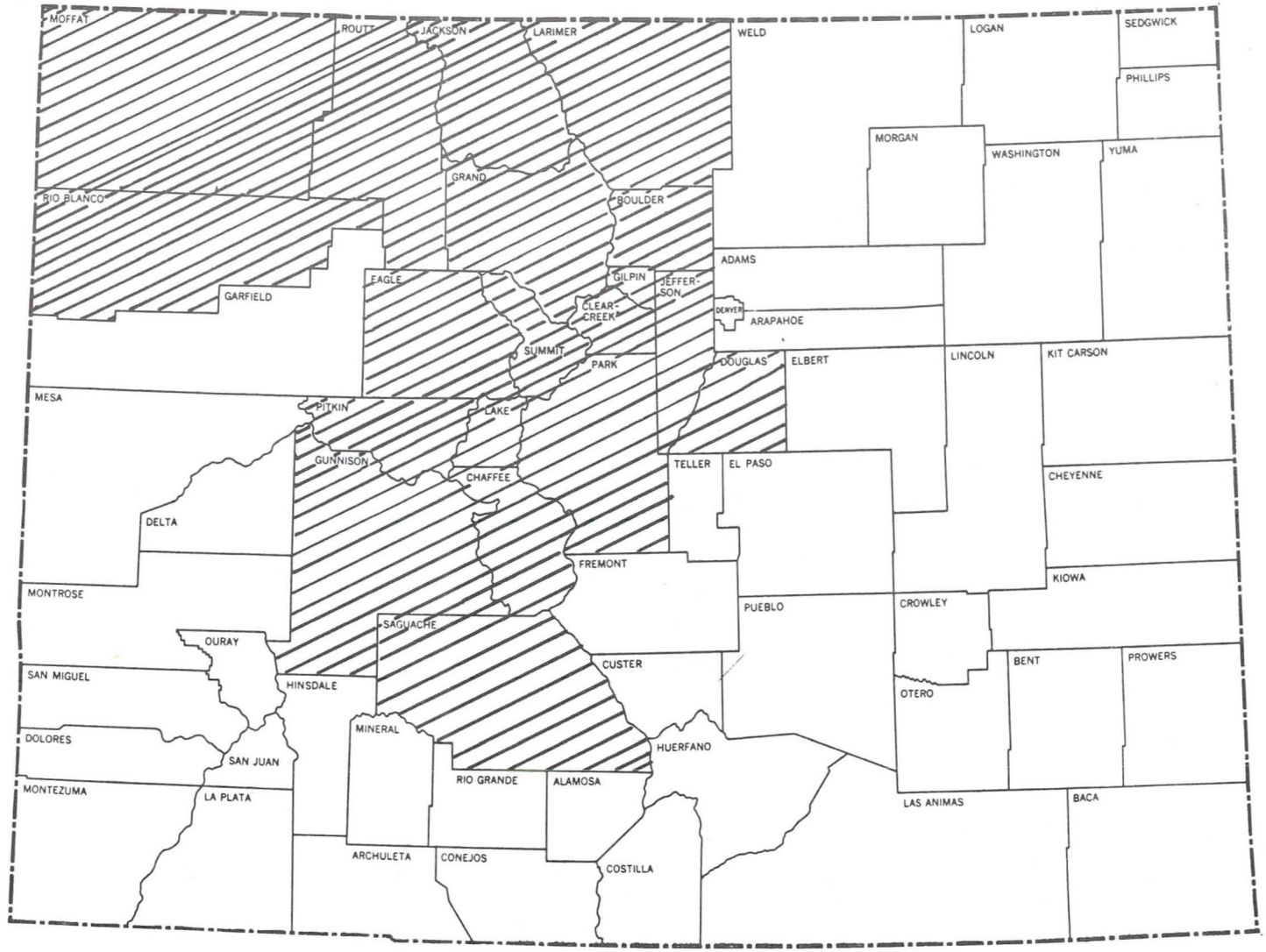
A P P E N D I X I I I

Distribution Maps -- Mistletoes in Colorado

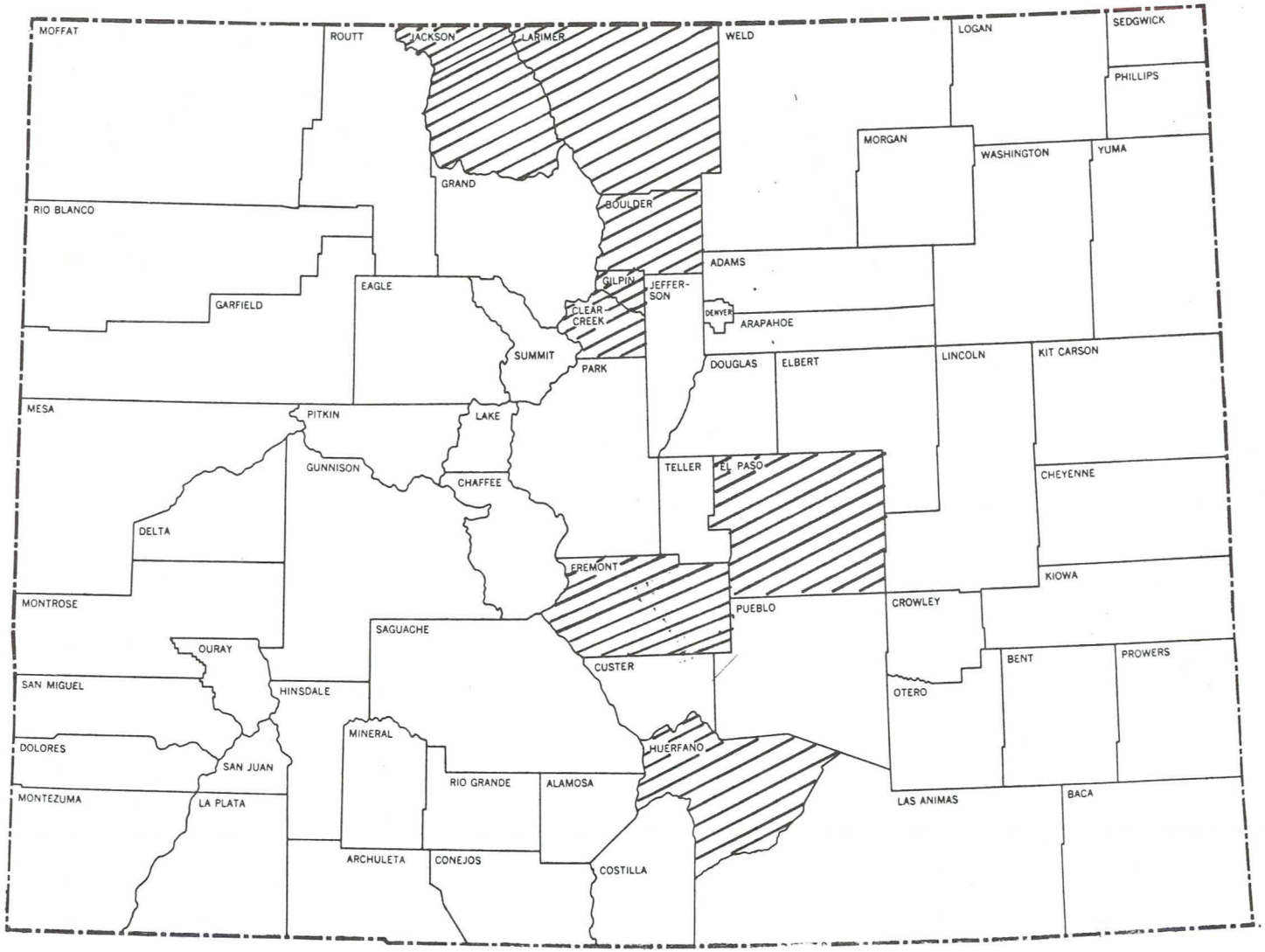
The following maps indicate counties in which the various species of *Phoradendron* and *Arceuthobium* have been recorded.

Acknowledgment is made to Dr. F. G. Hawksworth, from whose files these maps were made.

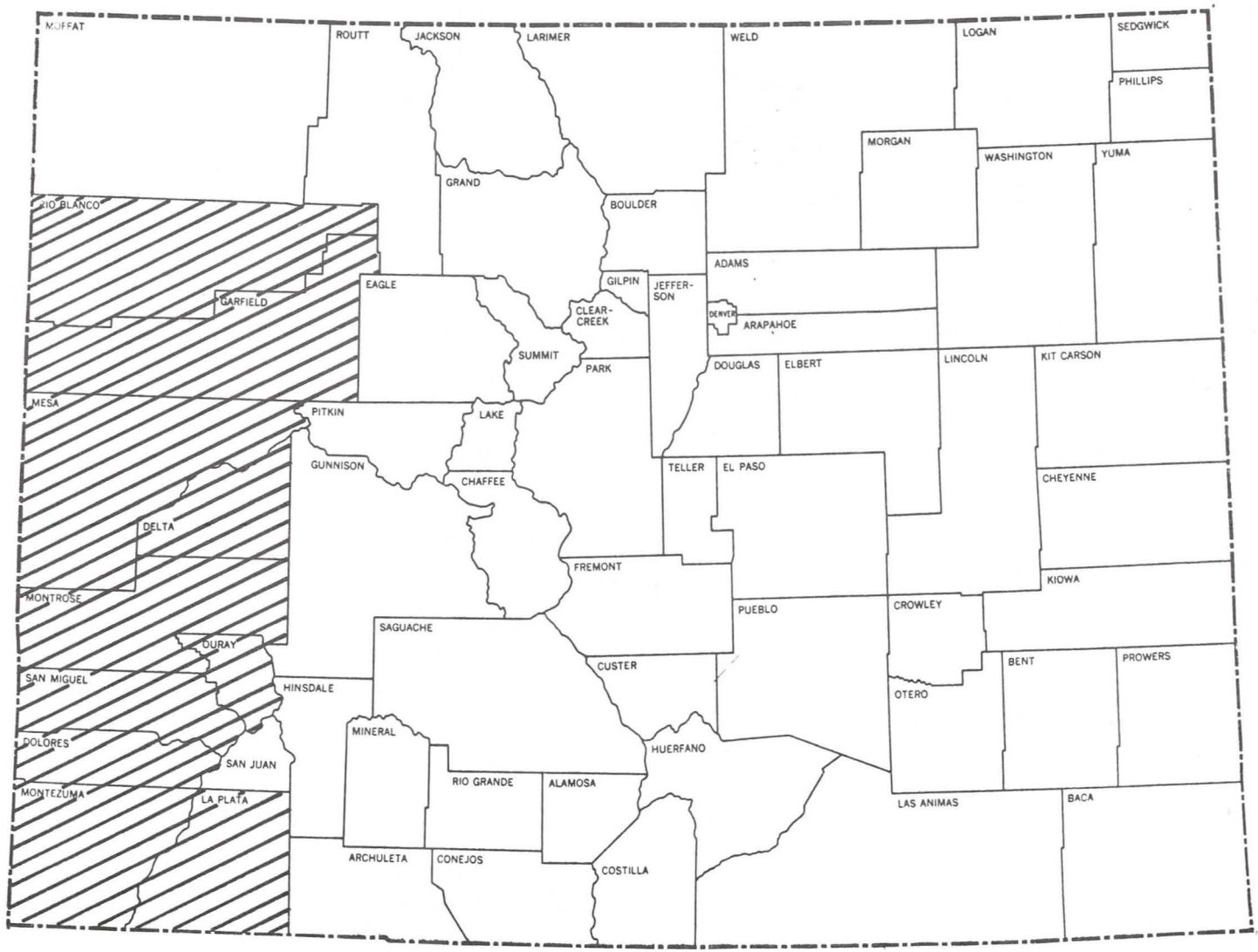
Known Distribution (as of summer 1977) Of:
Arceuthobium americanum on lodgepole pine and other pine species (From the records of F. Hawksworth)



Known Distribution (as of summer 1977) Of:
Arceuthobium cyanocarpum on limber pine and other pine species (From the records of F. Hawksworth)



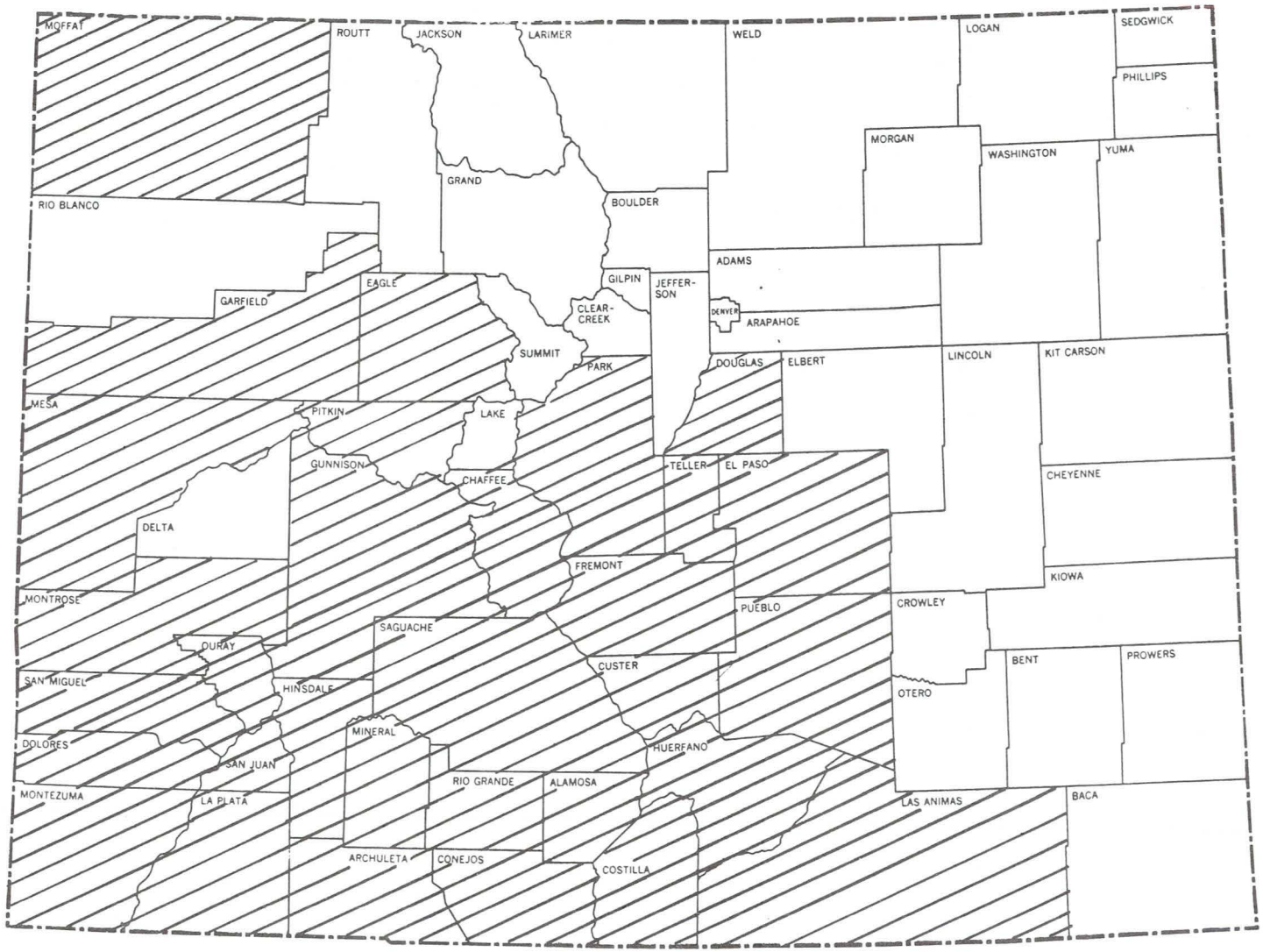
Known Distribution (as of summer 1977) Of:
Arceuthobium divaricatum on pinon (From the records of F. Hawksworth)



Scale of Miles
0 10 20 30 40 50

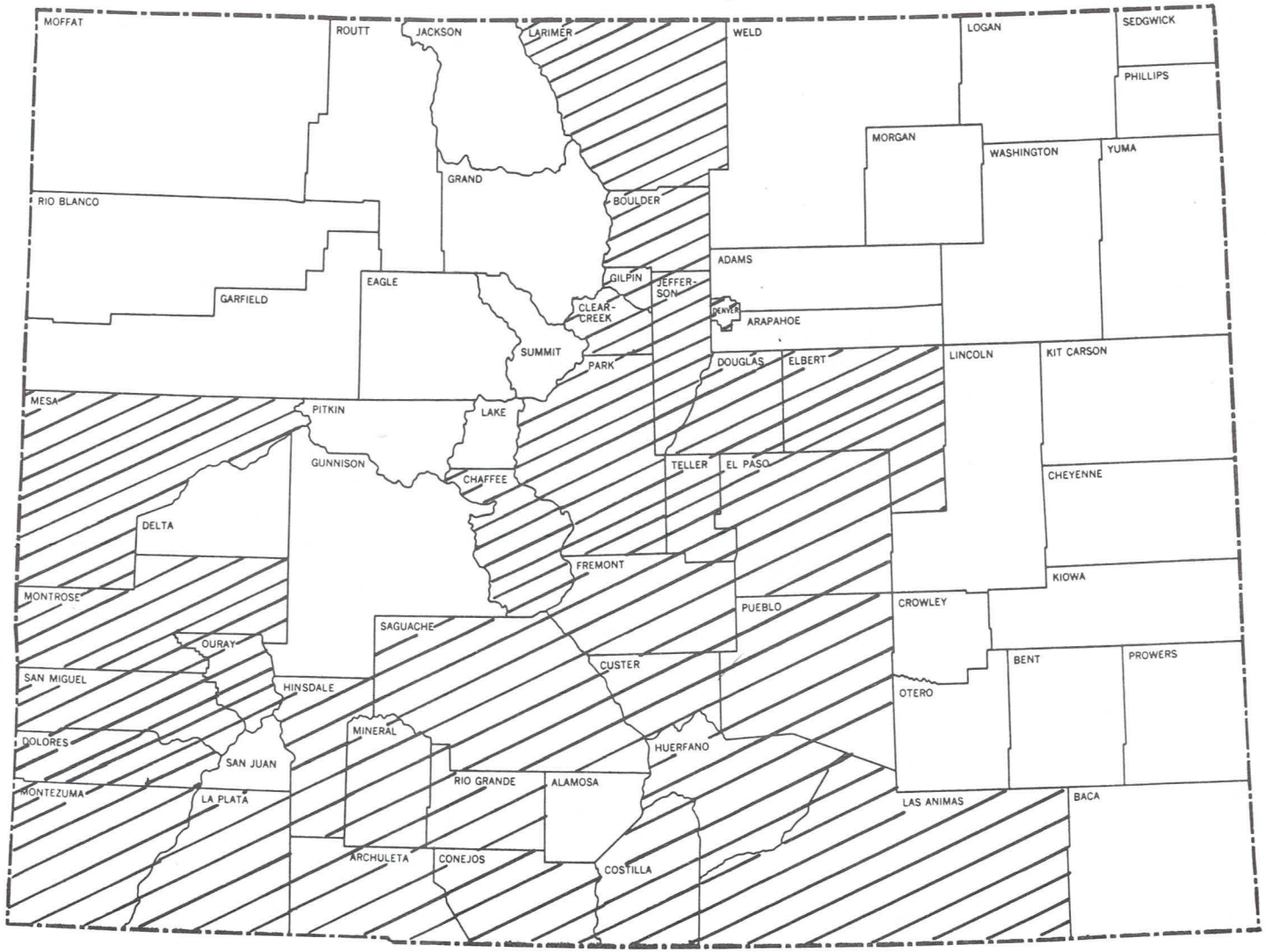
Known Distribution (as of summer 1977) Of:
Arceuthobium douglasii on Douglas-fir

(From the records of F. Hawksworth)

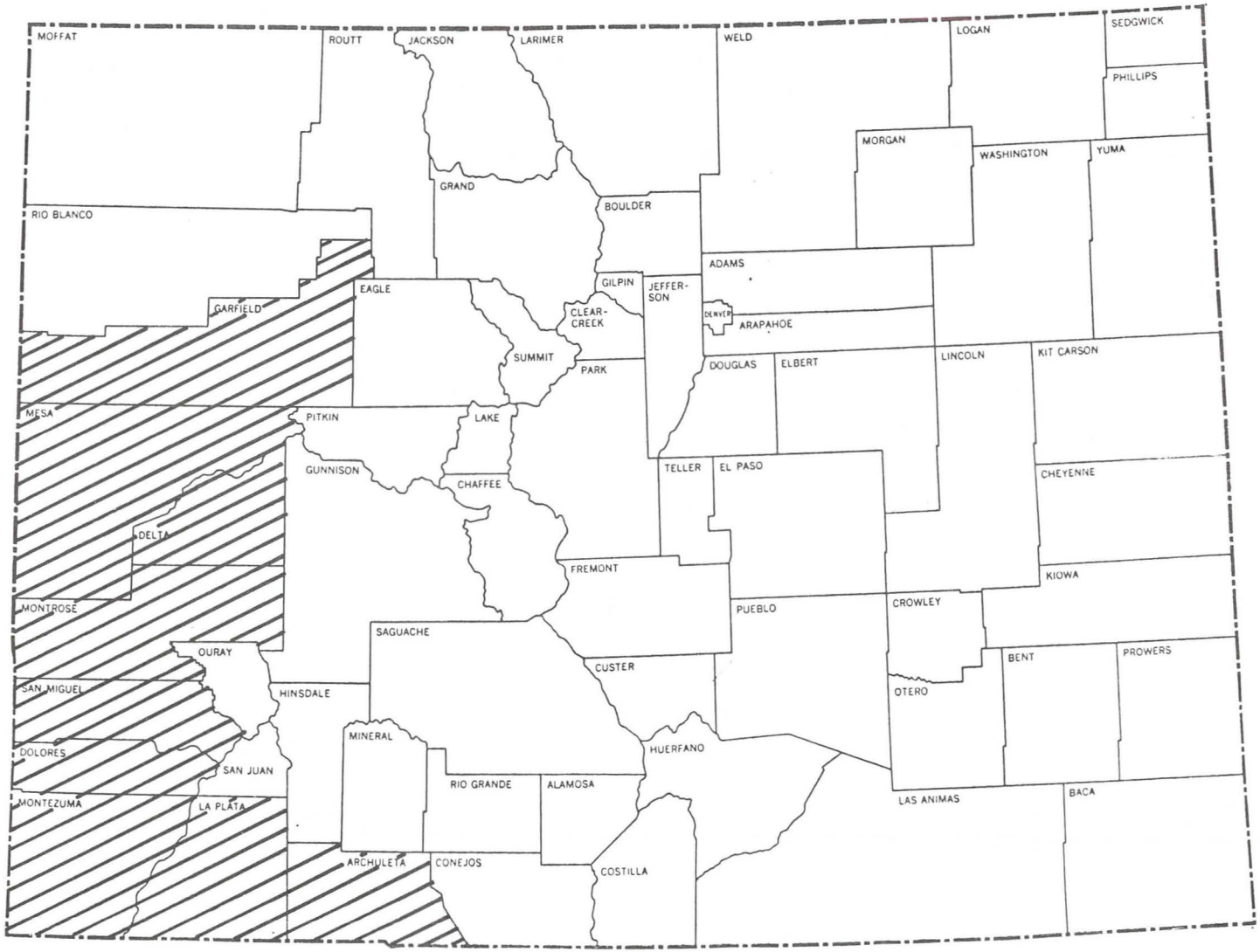


Scale of Miles
0 10 20 30 40 50

Known Distribution (as of summer 1977) Of:
Arceuthobium vaginatum subsp. cryptopodum on ponderosa pine and other pine species
(From the records of F. Hawksworth)



Known Distribution (as of summer 1977) Of:
Phoradendron juniperinum var. juniperinum on juniper spp. (From the records of F. Hawksworth)



Scale of Miles
0 10 20 30 40 50

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